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## Tarvia

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*In Circle*—Boston Post-Road—a Connecticut section—treated with "Tarvia-B."

*Bottom*—Harrisburg Pike near Columbus, O., built with "Tarvia-X," 1915.



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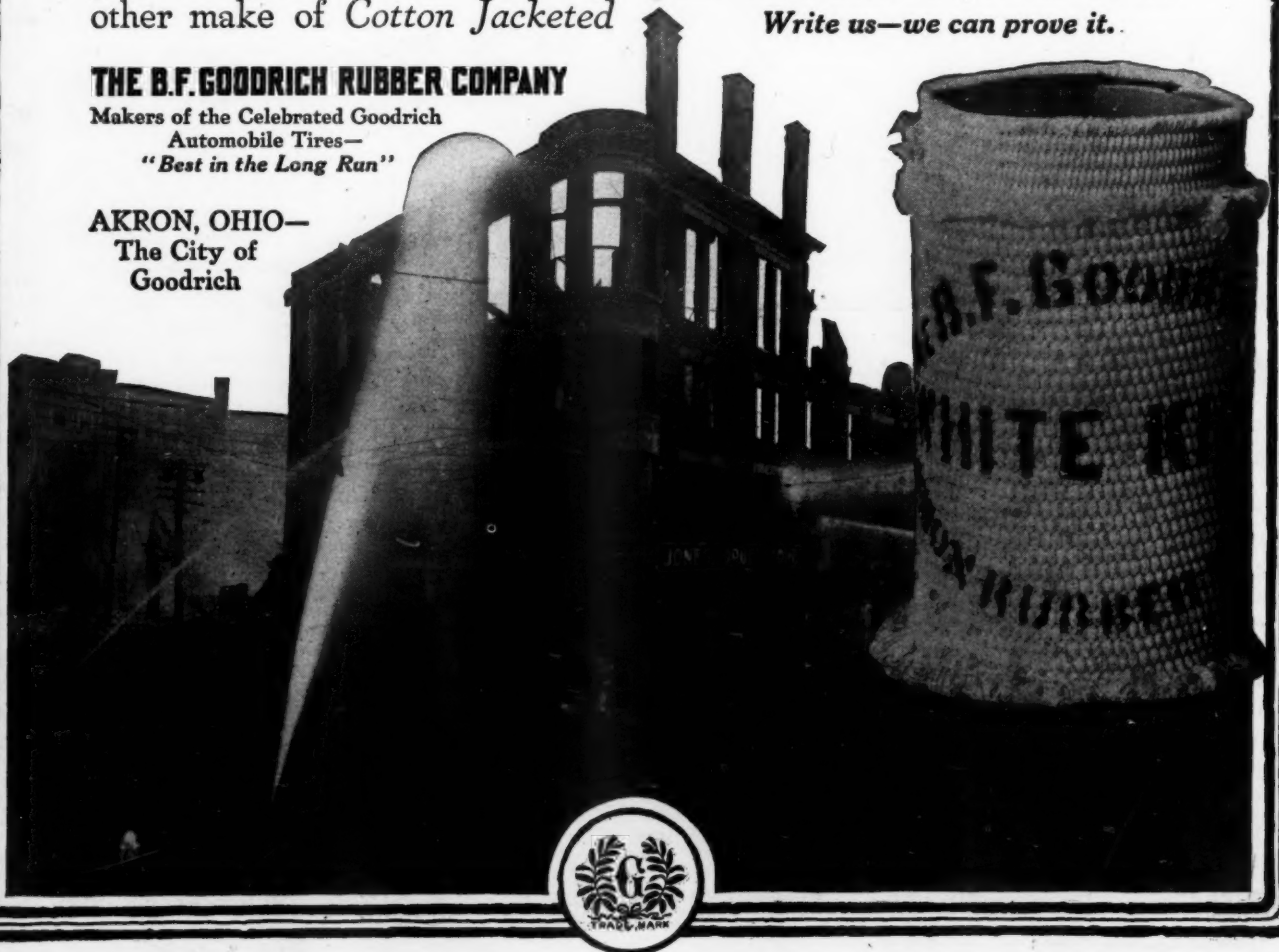
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# Municipal Journal

Volume XLIV.

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No. 10

## MAINTAINING RESERVOIRS IN TROPICAL COUNTRIES

### How Reservoirs of the Canal Zone Water Supply Are Protected from Pollution by Trees and Undergrowth, Grass, Aquatic Plants, and Microscopic Organisms—Stagnation and Putrefaction in Reservoirs.

The plants used for purifying the water supplied to the United States settlements in the Canal Zone were described in *Municipal Journal* for April 19, 1917, together with a number of interesting features connected with their operation. As stated then, most of these were due to conditions peculiar to a tropical climate, but which to less degree might be found in the southern part of the United States. The 1917 report of Geo. C. Bunker, Physiologist to the Panama Canal, shows that many of the same experiences were repeated last year, but remedies had been applied successfully to others. Some of the more interesting portions of the report will be found abstracted in the following article, and in one or more to be published later.

There are many valuable data contained in the report, being those collected during the year relative to the effect upon the water of vegetation, plankton, algae, heat and other conditions; the presence and significance of various bacteria; the results of variations in treatment by sedimentation, aeration, chemicals and disinfectants; the effect of filtered water on metal pipes of various kinds. Unfortunately this report exists in typewritten form only, no provision having been made for printing it, and the material is so voluminous that it is impossible to give more than a few brief synopses in a periodical like *Municipal Journal*.

There are four reservoirs in use in connection with the water supply of the Canal Zone—Agua Clara, 69.5 acres water area, 612 million gallons; Brazos Brook, 156.0 acres water area, 650 million gallons; Rio Grande, 62.0 acres water area, 400 million gallons; and Camacho, 38.4 acres water area, 283.5 million gallons.

The watersheds of the four reservoirs in use by the Panama Canal are free from pollution of human origin. They are, however, subject to pollution from the large numbers of wild animals in the jungle growth.

The rapid cycles of life and vegetation in the tropics produce a large amount of material from which organic matter is extracted. The principal sources of the latter are: Trees and undergrowth; grass; aquatic plants, and microscopic organism.

*Trees and Undergrowth.*—The feeders of the reservoir run through the jungle, which is so dense that one has to walk in the bed of the stream with a machette man in advance, in order to reach their sources. The trees, bushes, creepers and vines are thickly entangled along the banks and overhead. Under these conditions large numbers of leaves fall, especially during the dry seasons, upon the beds of the streams, on their banks, and into pools of stagnant water. A few of the feeders on some of the watersheds maintain a constant though small flow, but the majority dry up soon after the wet season closes. In case there is sufficient rainfall to overbalance the



CUTTING GRASS AROUND THE SHORE OF RIO GRANDE RESERVOIR.

evaporation, the water in some of the pools remains during the entire dry season, and extracts a large amount of coloring matter from the leaves which have collected. The contents of these pools, together with the leaves on the dry portions of the beds of the streams, may be flushed into the reservoir by the first heavy rains of the wet season and occasionally by unusually heavy rains during the dry season. The majority of the leaves and twigs sink to the bottom of the reservoir at the mouths of the feeders, furnishing material for putrefactive action, which may readily be observed by pushing an oar or stick into the soft mass with a resultant liberation of the gases which accumulate during the putrefaction of the organic matter. During the dry season the elevation of the reservoir may fall sufficiently to bring this highly colored stagnant water into circulation, with the result that soluble and colloidal decomposable material is carried out into the main body of the reservoir. In addition, a large amount of organic matter is washed directly into the main body of the reservoir by the rains falling on those sections or areas of the watersheds which slope toward the shore line and which are covered with leaves and rotting vegetation.

The torrential rains which frequently occur in the rainy seasons over relatively small areas of the watersheds bring down boulders of considerable size, large amounts of gravel, soft rocks, soil, dead vegetation, broken branches of trees and decaying logs, with the result that miniature deltas have been formed in the last few years at the mouths of many of the feeders.

The floors of the watersheds are covered with thick carpets of fallen leaves and other materials from the trees and miscellaneous vegetation, some of which is carried in suspension or solution by the run off.

**Grass.**—Luxuriant growths of various grasses and weeds contribute as much, if not more organic matter than do leaves. Para grass in particular, which grows very abundantly along the shore line of Rio Grande reservoir and on low flat areas of the catchment basin and is alternately exposed and covered by fluctuations in water levels, adds a large amount of coloring matter to the water. With a shore line 20,000 feet long, it is impossible to cut all of the grass which will be flooded by a quick rise in the water level at the start of the rainy season, unless a large gang of men is employed with a resulting excessive cost of maintenance. Before the entire shore line is cut and the grass disposed of by a gang of twelve men, the water level in the dry season has dropped and additional areas been exposed for growth of grass, so that not only is the number of square feet of grass cutting area increased, but the grass first cut will be high enough to call for a second cutting. Flooded grass rapidly turns brown and increases the color of the water materially, in addition to furnishing organic matter for the putrefactive reactions in the bottom layers of the water.

Para grass will grow in the water as well as on land, and it is not uncommon to pull out stalks 10 to 12 feet long, with joints 12 to 18 inches apart, which, if thrown on the ground, will sprout from each joint, the sprouts growing at the rate of 6 to 7 inches in 21 days. It grows so thick that it requires two men to push an ordinary row boat through it by poling. During the rainy season it grows at the rate of 13 inches in 21 days on the shore line of Rio Grande reservoir. Large numbers of birds live in it, and add their quota of members of the Colon group to the surrounding water.

Microscopic organisms, classed as littoral, attach themselves to grass growing in shallow water or along the shore line, from which they are washed off by wave action and scattered throughout the water. Large numbers of the genus *Rivularia*, in the typical brown colored hemi-

spherical or bladdery forms, are attached to the submerge stalks of the grass.

There is a difference in regard to the growth of grass on the shore lines of the four reservoirs. Around Agua Clara reservoir, with a large percentage of its shore line made up of red clay banks, the growth of grass is relatively slight. In fact, a more vigorous growth would be desirable to prevent erosion of the banks and resulting addition of iron to the water. At Brazos Brook reservoir, where the water is maintained at a relatively constant level, the removal of grass from the shore line is not difficult. At Rio Grande reservoir there is an abnormal growth of grass and its removal is very expensive.

**Aquatic Plants.**—In Brazos Brook reservoir there is a luxuriant growth of a pond weed known as "*Najas marina*" which grows mostly in shallow water. In what is known as the upper reservoir it grows very abundantly and removes considerable of the suspended matter from the inflowing weight, but later on sinks from the accumulated weight and materially increases the amount of organic matter on the bottom of the reservoir. Three other varieties of water weeds have made their appearance in this body of water. These aquatic plants have appeared in the last two years, and promise to become a serious proposition, as their removal is expensive. In the other three reservoirs they are present in limited numbers in the shallow water areas.

**Microscopic Organisms (Plankton).**—Although of minute size, the plankton forms furnish, on account of their rapid reproduction and short life, an amount of decomposable material to the water of a reservoir which must be taken into consideration as an important factor in the exhaustion of dissolved oxygen. Camacho reservoir during the last three years has been distinguished by the rapid growth of *Chlamydomonas* and *Peridinium* in sufficient numbers to add a noticeable turbidity and to impart a greenish or brownish tint to the water. Very little trouble has resulted from the development in any of the reservoirs of disagreeable odors and tastes due to the growths of microscopic organisms.

#### STAGNATION AND PUTREFACTION.

Stagnation and putrefaction of the volumes of water in the reservoirs below average depths of 13 feet have been responsible for more complaints from consumers and the distribution of water of poor quality, from the standpoint of appearance and chemical composition, than any other factors in the water supply system of the Panama Canal.

Stagnant layers of water with high color and iron contents and disagreeable odors are frequently found 10 feet below the surface of some of the reservoirs, and at times even closer. While it is advisable to equip reservoirs in temperate climates with floating intakes so that the water may be drawn from any desired level, it is absolutely necessary in the tropics to install an adjustable intake in place of a series of fixed intakes located so as to draw water from the top, middle and bottom. It must be remembered that fixed intakes do not permit the withdrawal of water entirely from the planes of their elevations, but some water above and some below, in fact water all around the intakes, will be drawn upon.

Adjustable intakes are especially essential if the water is not subjected to any purification other than that of storage in the reservoir. Even if it is to be used as a raw water supply for a purification plant, it is advisable to have considerable flexibility in the intaking of the water in order to avoid throwing a heavy load on the aerators. If the purification plant does not include an aeration unit, the use of other than surface water is inadvisable.



All reservoirs in the tropics should be provided with blow-off valves in order to waste the bottom stagnant layers of water after heavy rains, rather than to allow the fresh run-off to waste over the spillway. During the course of a rainy season, it is generally the case that the blow-off valve may be opened several times unless the capacity of the reservoir is small and the water supply is nearly exhausted at the end of the dry season. In such a case (Camacho reservoir for instance), it is necessary to store all of the run-off, and if, near the end of the rainy season, there is sufficient rainfall to start the water running over the spillway, the blow-off valve is opened for a few days. During the last two years it has been opened only once each year. In the case of Agua Clara reservoir, where the water level drops about 5 feet during the dry season and is replaced during the first part of the rainy season, the blow-off valve is opened several times during the last four months of the rainy season. If water is not wasted from the bottom of a reservoir in the tropics, the zone of stagnation will gradually climb nearer the surface. The drain lines from the gate chambers should also be blow off occasionally to remove accumulations of mud.

#### MAINTENANCE.

At each reservoir a caretaker directs the work of a maintenance gang which cuts the grass around the shore line, cleans the beds of the feeders, clears off the brush and trees growing along the latter and the shore line of the reservoir proper, and takes care of the miscellaneous work which arises from time to time. Daily records of the rainfall and elevation of water are kept.

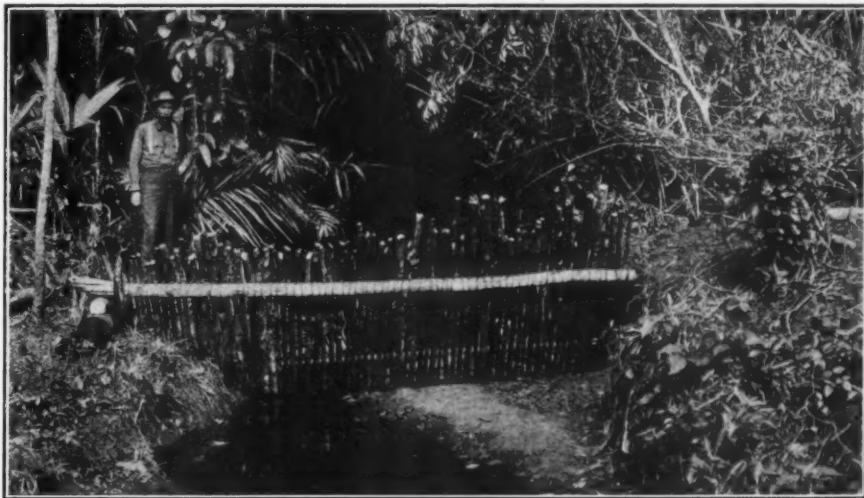
During the present fiscal year more attention has been given to the feeders than in the past. The banks of a considerable number have been cleared from 50 to 75 feet on either side, which is the minimum distance for permanent improvement and elimination of a large number of leaves. The trees and undergrowth were burned after having dried sufficiently. In other cases only a narrow strip close to the water has been cleared as a temporary improvement in order to eliminate vegetation which would fall directly into the feeders.

It has been necessary to clean the dry beds of the feeders several times during the dry season in order to prevent a large amount of leaves from being washed into the reservoir at the start of the rainy season. The old deposits of rotten leaves and vegetation have been removed from all of the pools, and the pools, if they were not too large, filled with rocks in order to eliminate the growth of algae and sources of high color. In a few cases the skeletons of dead animals were found.

Robert Houston, caretaker of the Agua Clara reservoir, suggested the use of screens set across the mouths of the feeders, and at different points along their courses, for catching leaves and debris washed down by the heavy rains. (One of the screens is shown in the illustration. In the background may be seen the heavy growth along the banks of the feeders, a typical example of all the feeders before the clearing was started. In the foreground is a pool in which highly colored water is developing.) The screens are set at an angle across the feeders in suitable locations, and braced preferably against trunks of trees. Fifteen of these were constructed and placed in position on the various feeders discharging into Agua Clara reservoir before the rainy season started.

Sufficient amounts of leaves and debris were caught to justify their use and maintenance.

In the case of reservoirs similar to Agua Clara and Brazos Brook, where there are comparatively small variations in the water level, a large share of the gang's time may be devoted to clearing, but in the case of the reservoirs similar to Camacho and Rio Grande, the regular maintenance gang is required for grass cutting during the greater part of the year. Most of the grass cutting is done by machettes, as the majority of the laborers are accustomed to their use, and the roughness of the ground precludes the use of scythes. At Rio Grande reservoir, where a larger amount of grass is cut than at any of the other reservoirs, scythes are used over the greater part of the shore area, but it was first necessary to smooth the ground by removing the stumps and small rocks. Where the topography of the ground is suitable, and it is necessary to cut large amounts of grass, the work may be done much faster and cheaper by scythes. In some cases the grass is raked back a few feet from the water's edge, in other cases it is loaded on wood frames and carried back from the shore line for varying distances, depending upon the slope of the bank, and dumped in piles. During the dry season the grass is burned, but during the wet season it is allowed to accumulate until the dry season. Where there is a comparatively small variation in the water level of a reservoir,



LEAF CATCHER AT MOUTH OF FEEDER TO AGUA CLARA RESERVOIR.

it appears preferable during the wet season to cut only a strip sufficiently wide along the shore line to keep grass of more than 3-inch height out of the water in case the water level is raised six inches or so, because it is impractical to burn the grass, and consequently it soon starts to decay, and the rains wash the organic matter into the reservoir. Likewise it is inadvisable to cut the grass on the banks of the feeders during the rainy season.

In the case of a reservoir like Camacho, where there is a drop of 25 feet in water level in six months and the lowest level is reached during the rainy season, it is necessary to keep the grass cut short over the whole of the exposed shore area in order to be prepared for a sudden rise in the water level after a heavy rain. The amount of organic matter added to the water by rains percolating through the piles of cut grass will be far less than added through the flooding of several thousand square feet of grass a foot or so high.

The maintenance gangs are provided with sanitary buckets, which, at the end of each day's work, are emptied into pits or buried outside the limits of the watershed.

Cutting grass around the Rio Grande reservoir was

continued throughout the year, the least amount being in February—32,300 square feet, and the maximum in August—451,130 square yards. The cost varied from 6 to 22 cents per square foot, and totaled \$5,111. The highest cost was that of cutting grass standing in water, performed by men working in boats. The cost includes raking the grass back and burning it.

—Buy War Saving Stamps—

## NEW FEATURES IN BITUMINOUS PAVEMENT PRACTICE.\*

### Summary of Recent Developments Throughout the Country—No Changes in Basic Methods—Improvements in Methods and Materials.

By CHARLES M. UPHAM,†

Of thirty-five state highway commissioners and engineers and consulting engineers who replied to inquiries by the author concerning any new features in road construction that had been developed within the past few years, thirty-one said that there had been none in basic methods. Even in details of construction and in road materials no radical changes have taken place during the past four or five years. Some new details, however, are very important in that they enable excellent pavements to be produced at a much lower cost than formerly.

In bituminous roads the fundamental requirements are a dense aggregate bonded together by suitable asphalt. The bituminous roads of the mixed process can be generally grouped into two types, namely: Asphaltic concrete type, in which the larger stone aggregate is used; and a pavement of the sheet asphalt type, in which finer aggregate is used. There is still another pavement that greatly resembles these, but creates still another type, that is made up of pulverized clay or other very fine aggregate, saturated with bitumen.

Of the pavements of the type in which large stone is used in the aggregate, very good results have been obtained by Mr. Dean in Massachusetts in his "gravel-asphalt concrete." In this pavement the attempt is made, by various proportioning, to utilize everything in the gravel pit, either in the base course or in the wearing surface. A gravel base of four inches is generally used in the construction of this pavement. The base is thoroughly rolled and filled with sufficient screenings to fill the larger voids but not come quite to the surface of the base stone. The size of the stone in the base course varies from ½-inch to 3 inches. The gravel-asphalt wearing surface is prepared by heating the gravel aggregate and then mixing with the asphalt. The size of the aggregate is between ¼-inch and 1½ inches, and may constitute from 15 to 75 per cent of the total pavement. The remainder of the aggregate would be sand from the same pit, the proportion being determined after an analysis of the gravel. The wearing surface is always spread from dump boards and then rolled until solid. The asphalt used is about 70 penetration and heated by steam coils. Massachusetts is now constructing a large mileage of this type of pavement.

Mr. Everett of New Hampshire has developed a new method of constructing asphaltic concrete which he calls "modified asphalt pavement." This is somewhat similar to the Massachusetts type, excepting that the amount of the larger stone in the aggregate is always less than 15 per cent. This pavement resembles the Topeka mixture with the exception that there is an additional aggregate present larger than is used in the Topeka. The grading

of the aggregate is controlled by constantly testing the gravel and making up charts known as control charts. If the tests show that the aggregates are outside of certain limits, new proportions are immediately set.

The requirements of the modified asphalt pavements are as follows:

#### Mineral Aggregate.

Passing 200-mesh sieve	from 5 to 11 per cent
Passing 40-mesh sieve	from 18 to 30 per cent
Passing 10-mesh sieve	from 25 to 55 per cent
Passing 4-mesh screen	from 8 to 22 per cent
Passing 1-inch screen	less than 15 per cent

This method has been used for two or three years and is considered very satisfactory. This type of pavement is especially adapted to localities where there are numerous gravel pits.

Several new features have been added to some of the pavements of sheet asphalt type. One that has been reported as being very satisfactory is the use of ½-inch stone rolled into the surface of the sheet asphalt or Topeka pavement. This makes a pavement that is less slippery. Although this has but recently been tried out on a large scale, it was tried out to my knowledge on a few very successful experiments about six years ago. At first glance it would be supposed that the ½-inch stone would soon wear away with the surface of the sheet asphalt, but as a matter of fact this stone seems to be driven into the surface as well as worn away. On a moderate-traffic roadway it has been found that considerable of this ½-inch surface stone was still in the surface even after four years' use. Probably the most successful way of applying this stone is to first heat the chips and apply them before the pavement has become thoroughly cooled, which then allows the stone to be slightly rolled into the surface. The size of the stone should be from ¼-inch to ¾-inch.

Another pavement of the mixed type that is reported to have been laid successfully is one in which pulverized clay is used in the aggregate. This clay has the property of absorbing considerable asphalt, and in some samples as much as 18 per cent of asphalt has been found. It has been claimed that the asphaltic material penetrates the clay until it is in a saturated condition, which makes the pavement practically waterproof and very dense. At first there was some difficulty in the physical making of this pavement, but I understand that this has been overcome. It has been reported that this pavement has been laid successfully on an earth foundation.

Another pavement of the mixed type which a short time ago created a great interest was what was known as the "fibred asphalt pavement." This was made by mixing small pieces of wood fibre (which is the refuse from tanneries) with sand and asphalt. Experiments carried on in Wilmington proved that under certain conditions this would make a very satisfactory pavement if made up in this manner. The test piece, though small, had stood severe traffic for over a year, at which time the entire street was replaced with a new pavement. The theory of this pavement is that the moisture has been extracted from the wood fibre and the asphalt will penetrate the wood and form a wearing surface which when compressed would approach wood block pavement. I understand that some of this pavement has been laid in West Virginia.

A pavement that has not become generally used but is very interesting on account of being radically different from most pavements, is what is called "Strenolith." This is supposed to be made of sand, oxide of iron and resin. A few years ago a sample was submitted to our laboratory. It had the appearance of brown stone and was very hard. It had been used as a base somewhere in

\*Part of paper before St. Louis convention of American Road Builders' Association.

†Chief Engineer, Delaware State Highway Commission.



New York City, where I understand there is an entire block of this pavement. Very little is known of the exact analysis of this type or its practicability from standpoint of costs. In view of the increased price of materials of construction it may be worthy of investigation and consideration.

There have been very few new features under the head of bituminous penetration. Among those that have been brought to notice is one devised by Mr. Shirley of the Maryland State Highway Commission. The first course of this pavement is constructed as for a water-bound macadam. The top course is thoroughly rolled and compacted and then covered with a coat of trap rock screenings, varying from dust to 1-inch pieces. Upon this is spread a coat of tar, of the consistency that will run when cold, in quantities from .6 to .75 of a gallon per square yard. It is necessary that this tar be evenly distributed. Upon this tar material is uniformly spread another light coat of screenings. This is then rolled until the entire surface presents a smooth and even appearance. The last coat of screenings is sufficient to prevent the tar from adhering to the wheels of the roller. After this has been spread and rolled thoroughly, there is applied .6 to .75 of a gallon of asphalt, applied cold. On this coat of asphalt is spread stone chips ranging from 1-inch to ½-inch in size. This is rolled until the surface is smooth and shows no effects from the passage of vehicles. All the screenings or chips are applied from piles or wagons with shovels, and extreme care is taken to keep the surface during construction free from ruts, depressions or waves. This construction has been used for about two years in Maryland and has been found to be very satisfactory.

Another penetration method has been developed by Mr. Hirst of Wisconsin. The construction is very similar to that of water-bound macadam, except that the last course is not filled with screenings but is nearly filled with stone chips. Into this is poured ½-gallon of light tar or oil and covered with ¾-inch chips, enough of the latter being put on to keep the roller from picking up the asphalt. After rolling, another half-gallon of bitumen is applied and covered with more chips. After this is rolled it is covered with ¼-gallon of material and covered with small chips. It is stated that this work costs very little more than water-bound macadam, and offers an excellent foundation for subsequent bituminous treatment.

There are a few new types of pavement that can now only be considered in the experimental stage. Among them is one that is new, and, while it does not seem from the nature of the ingredients that the pavement could be permanent, it has given good results up to the present time. This pavement consists of the use of straw, sand and asphalt, made up by the layer method.

A new feature in a base course for a wearing surface is contained in a sample laid in Florida and several sections around Philadelphia. This base is made by neutralizing the acid condition of the soil used in its construction and then mixing it with a new kind of cement. It is claimed to be cheaper than Portland Cement, and almost any class of material can be used as the aggregate in the base course.

A new feature in the maintaining of bituminous surfaces has been developed recently. It consists in an application of bituminous material to the surface and then covered with sand and fine chips. In the case of bituminous concrete that has been laid for several years and presents a worn surface with the aggregate exposed, exceptional results have been obtained by rejuvenating this bituminous concrete with a light bitumen. Many cut-back products have been developed for this purpose.

One very satisfactory product has been applied in two applications. The first, an asphalt cut-back of a very fluid consistence, is applied to the pavement and allowed to dry out for three or four hours. Directly upon this is applied a cut-back of medium consistency, which is covered with sand immediately. Excellent results have been obtained where this method has been used.

Recent advances in the prices of lighter oils used in making up the cut-back flush-coat materials have demanded experiments whereby cheaper materials can be substituted for the light oils. A new feature in this line is the use of an emulsified asphalt whereby water takes the place of the light oils used in cutting back the asphalt. When the emulsified asphalt is used, only one application is made. I have been informed by one of the producers of this emulsified asphaltic material that it has worked very satisfactorily in rejuvenating old city pavements and that excellent results have been obtained on road work. A little longer time is required for the water to dry out, but the purpose of the operation, which is to seal the fine hair cracks and cover the exposed aggregate surface with asphalt, is accomplished. This has been tried out on highway work with the same success as in city pavement.

The use of what is called cold-patch material is common in certain localities, but I find there are other places where this has been used very little if any. A new feature in this respect is to patch the ruts or holes with a mixture made up of coarse sand or stone and an emulsified or cut-back asphalt. This mixture can be prepared without heating the aggregate and the mixture can be tamped or rolled while in a plastic state, and after drying out will present a hard, firm patch. Cold-patch materials are made up with both tar and asphalt as a base.

A few new features in bridge work that have helped to overcome the difficulty in keeping the plank floors of bridges in good condition have been recently reported. Several ways of treating plank have been evolved with only partial success. The location of many country bridges, as well as their size, would not warrant an expenditure of any great amount for the construction of a protective coating over the plank floor. The use of an asphaltic concrete wearing surface made up of stone and sand and an emulsified asphalt has provided at a moderate cost a wearing surface for bridges that is both substantial and inexpensive. Many times the aggregate can be secured locally and the asphalt mixture made without heating. On account of the character of the asphaltic mixture, it can be put down by tamping it into place. The material may be mixed either by machine or hand. The ingredients that are proving to be most successful are a mixture of stone chips ranging from ¾-inch to dust with the emulsified asphalt. It is stated that this mixture readily packs under traffic and forms a mat that resists the wear of traffic. Considerable of this work has been done under ordinary conditions at 30 cents per square yard. The thickness of the mixture should be 1 inch or 1½ inches.

#### Discussion.

*By Charles Carrol Brown, of Municipal Journal.*

One or two additions may be made to the new developments mentioned by Mr. Upham which seem to be of considerable importance.

Warren Brothers Company has developed a method of application of seal coat in connection with the construction of its pavements, taking the place of the old method of application of flush-coat bitumen and dry aggregate spread thereon. The new method consists of incorporating hot bitumen and aggregate in the mechanical mixer in which the wearing surface mixture is

made; spreading this seal-coat mixture to a depth of about  $\frac{1}{2}$ -inch (loose measurement) over the wearing surface mixture after the latter has been raked to the proper depth and grade, but before rolling the wearing surface, then rolling the two courses together with a three-wheel road roller. An additional quantity of the seal-coat mixture is spread over any portion of the wearing surface which the first rolling shows has not been completely covered with the seal coat. The rolling is continued until the wearing surface and the seal-coat mixtures are both thoroughly compressed and blended together.

The seal-coat mixture is made of aggregate (either sand or crushed screenings), all of which will pass a No. 4 screen and containing about 25 per cent of material passing a No. 80 and finer screens. The asphalt cement varies in penetration with climatic conditions, but is about 25 degrees softer than the asphaltic cement used in the wearing surface mixture. The mixed-method seal-coat mixture contains from 12 to 14 per cent bitumen soluble in carbon bi-sulphide. When completed, the seal-coat mixture has a thickness of about one-fourth inch over the top of the particles of stone in the wearing surface and is pressed and blended into the wearing surface to a depth of about one-fourth inch.

The advantages claimed for this mixed method over the flush-coat method of seal coat are that the entire material used in the mixed-method seal coat is available for permanent wear, while the greater portion of the dry aggregate used in the flush-coat (otherwise known as "squeegee") method quickly grinds up under traffic, washes and blows away and adds nothing to final wearing properties of the pavement. Also the seal coat of rich, soft bituminous mixture is very malleable and provides conditions for the greatest possible efficiency in waterproof wear-resisting properties. It does not increase the cost, the quantities of materials used in both cases being practically the same. The company began using this about four years ago and has used it in most of its work during the past two years.

Another pavement has been tried out by this company during the past six years, in which, while the concrete base is still plastic, there is placed on it a bonding course made of stone passing a 1-inch and retained on a  $\frac{1}{2}$ -inch screen combined with one-sixth its volume of cement made plastic with water, which material is spread to a depth of  $1\frac{1}{2}$  inches and rolled lightly so that it is pressed into the base to a depth of about  $\frac{1}{2}$  inch. As soon as the cement in the bonding course has set, the surface is flushed with a hot mixture of asphaltic cement and very fine sand in about equal proportions, so as to fill all the voids and coat the entire surface of the pavement with about  $\frac{1}{4}$ -inch of rich, malleable, waterproof bituminous cement. On this is spread  $\frac{1}{4}$ -inch of stone screenings or coarse sand. This produces a concrete base and rich bituminous surface firmly bonded together. It requires about  $2\frac{1}{2}$  gallons of asphaltic cement per square yard. The name "Bitustone" has been given to this pavement.

— Buy War Saving Stamps —

### REMOVE SNOW FROM NEW YORK HIGHWAYS

At a meeting of the Highway Traffic Association of the State of New York, on February 19th, resolutions were adopted requesting the State Legislature to adopt amendments to the state highway law providing that "the state commission of highways shall cause the removal of snow from the roadways of trunk line highways connecting cities and those connecting industrial centers and cities when the accumulation of snow thereon shall render such highways unsafe or unserviceable for loaded vehicles;" and that "there shall be annually appropriated

for the removal of snow from trunk line highways an amount sufficient to provide therefor, based upon the estimates prepared and submitted by the commission to the Legislature as provided in" the existing highway law.

This action by the legislature was considered essential because the U. S. Quartermaster's Department has found it necessary to use the trunk highways for transporting army supplies; economic transportation by motor trucks requires that the roadways of trunk highways be maintained at all times of the year so as to permit of free and easy travel, and the accumulation of snow interferes with, and in many cases makes impracticable, economic highway transportation by motor trucks.

Others in the state have felt that New York has been remiss in this matter during the past winter. Among others, H. H. Franklin of Syracuse, in a letter to Senator J. Henry Walters, has said:

"Whatever the cause for the present railroad situation, there is absolutely no good reason why state highway transportation should be tied up. Perhaps the biggest help New York State could give the country at this time would be to promote highway transportation.

"Certainly it does seem that we should at least keep the great highways open. War or no war, it is absurd that roads built at such heavy expense should be largely out of use four to six months of the year.

"Keeping the roads open during the winter is not new. It was done before the war by the State of Connecticut and is still being done."

— Buy War Saving Stamps —

### OPERATING SMALL SEWAGE DISPOSAL PLANTS.

#### Features Peculiar to Small Plants—Recommendations for Operation of Imhoff Tanks—Foaming, Scum Prevention and Removal.

At a meeting of the New Jersey Sewage Works Association on February 15th, Geo. W. Fuller read a paper entitled "The Operation of Small Sewage Disposal Plants" which contained much excellent advice, and especially full suggestions concerning operation of Imhoff tanks. "Small plants" he defined as those of such size that the superintendent or man in immediate local charge is obliged to attend to all operations other than those that can be performed by the better class of common laborers. The man in charge is called upon to make such laboratory tests and attend to such mechanical appliances as are necessary, with little or no technical aid after the schedule of operations once becomes established. In this paper, the author had in mind only plants receiving the flow of separate sewers, with practically no trade wastes or street washings—conditions found in practically all of the plants in New Jersey.

He emphasizes the importance of each plant operator keeping a daily record of the more important items connected with the operation of his plant; these ordinarily including volume of sewage treated, stability of effluent (by the methylene blue test), volume of solids in influent and effluent portions of the plant in service, withdrawals of sludge from any portion of the plant, condition of filters, quantity of chlorine applied, if any, and such other tests as will indicate at a later date what the plant performance was at any given time. Also notes should be made concerning any abnormal features connected with the operation of the plant, such as odors, flies, filter clogging, etc. It is desirable that the operator study the behavior of his plant at different seasons of the year, and keep a diary in which to record his observations on various special points. Seasonal conditions may affect results considerably, but unless notes have been made of such



conditions in the past it will be impossible to compare with moderate accuracy the effects observed during one season with those encountered during a similar season of previous years.

#### IMHOFF TANKS.

Small plants, as distinguished from large ones, generally receive sewage in which the suspended matter arrives in a coarser condition, due to less opportunity of comminution because of the smaller collecting system and less duration of flow. As a result, the operator of an Imhoff tank for a small city usually has to contend with far more scum than is found at a plant for a large city. On the other hand, he is spared the difficulties connected with grit chambers for the removal of mineral matters washed from the streets. In addition to the less comminution of the coarser materials, he often finds these mixed with kitchen wastes which should have gone to the garbage can and with grease that tends to bind the particles together. At the new army cantonments, single-story tanks have been built partly in the interest of speed and economy of construction and partly in recognition of the flotation aspects of the sewage, which reaches the tank in a very fresh condition.

Plants that receive only a relatively small amount of sewage in the earlier months of their operation behave far better than do those that have a relatively high load factor at the outset. This goes to confirm the general belief that sludge-digestion chambers should be made materially larger than was believed in earlier years to be necessary. Dr. Imhoff himself had apparently reached this conclusion in 1916, when he prescribed that for towns of five thousand population or less, having separate sewers, there should be a sludge digestion capacity of at least 2.4 cu. feet per person. Mr. Fuller believes that this is none too large and implies that even a greater capacity might be desirable. He also believes that sludge beds should be much larger than was originally prescribed by Dr. Imhoff, probably because he had not given due consideration to the intensity of rain-fall in this country.

The operator of an Imhoff tank should see that deposits do not occur in the inlet channel nor upon the sides and sloping bottoms of the flowing-through or upper compartment of the tank, but these should be removed with convenient tools twice a day or oftener and pushed through the slot into the sludge-digestion chamber. These and other recommendations which were discussed at some length by the author were summarized by him as follows:

#### *Summary of Operating Experiences with Imhoff Tanks.*

—1. Small plants of the Imhoff tank type, receiving the flow of separate sewers, are frequently more difficult to operate than larger ones receiving the flow of combined sewers, because the relatively large size of the suspended particles reaching the digestion chamber respond for long periods at a time to flotation rather than sedimentation.

2. Careful attention to the prevention or frequent removal of stranded solids in the collecting sewers, inlet channels of the tanks and on the bottom and sides of the upper or sedimentation compartment; to the uniform distribution of solids in the several sections of the tanks; to the frequent removal of grease and scum from the surface of the sedimentation compartment, is helpful and important. But it will not necessarily eliminate abnormally long periods for the "ripening process," following which well digested sludge is obtained without objectionable odors.

3. Normal digestion of sludge to an inodorous humus mass, with a fairly uniform liberation of the resulting gases caused by the inevitable splitting apart of carbon,

hydrogen, nitrogen and sulphur atoms contained in the complex molecules of suspended organic substances, is seemingly effected by enzymes or liquid ferments excreted by certain kinds of bacteria.

4. When tanks are new, and when for any unforeseen reason old tanks lose their efficient digestive functions, ordinary bacterial decomposition predominates over enzyme digestion, with attending possibilities as to odor complications from incompletely digested sludge, or from the release of intermediate decomposition products, particularly those of a sulphurous nature, or from both. Tanks in this condition are said to be undergoing the "ripening process," which fortunately does not seem to be necessary as a rule other than with new tanks, although there have been some exceptions to this general experience.

5. There is no way of telling in advance how long a period of ripening may be necessary for a given tank, as different results come in different units of the same plant. Some kinds of bacteria grow prolifically and preclude the development of suitable enzyme-producing bacteria as a result of "bacterial antagonism" caused by the excretion of waste products. This may be as capricious a matter as the occurrence of weeds in a field or of algae in an unpolluted lake. "Seeding" a tank with ripened sludge from another tank has not proved to be as reliably helpful as was expected.

6. Objectionable odors may arise in varying degree, depending upon local factors, but largely upon the lack of opportunities for absorption of odoriferous compounds by surrounding water and upon accumulations of gas which may be released intermittently in masses or "whiffs," so to speak, following barometric changes and interruptions in free venting.

7. The secret of success in operating Imhoff tanks is to retain in them relatively small quantities of decomposing solids and to do all that is practicable to secure a proper balance between enzyme liquefaction and bacterial decomposition, with a predominance, of course, of the former. This explains why tanks receiving only relatively small quantities of sewage when new do so well in digesting sludge. It raises the issue of sludge storage capacities.

8. Quiescent masses of sewage solids, either scum or bottom sludge, are scarcely capable of satisfactory decomposition, as antagonistic products of bacterial life seem to have a decidedly retarding effect.

9. Lime will lessen excessive acid formation in sludge, but it will scarcely cause the establishment of the right kinds of bacteria for enzyme production. In fact, it may result in increasing abnormalities.

10. Agitation through pressure-water jets or paddling may be of aid, and in Europe mechanical stirring devices have been proposed. The benefit of stirring and mixing seems to lessen with increasing volumes of sewage solids in a tank, due to a loss of efficiency of the stirring arrangements. This step, if carried too far, may also remove entrained gas to such an extent that non-gaseous, sticky, foul-smelling sludge is obtained under circumstances requiring its removal and burial or treatment with a deodorant.

11. Acid foaming at gas vents sometimes becomes very bothersome where the gas vents contain large quantities of floating scum undergoing bacterial decomposition in the absence of adequate enzyme digestion.

12. Slot trapping by gas and gas-lifted solids, which fill the space above the slots, frequently accompanies foaming and may carry decomposing solids into the settling compartment from the sludge chamber below as well as by overflowing from the top of the gas vents.

13. Overflowing from foaming cannot be stopped in some tanks, even if the gas vents extend 5 or 10 or more feet above the flow line. High free board, hosing with pressure water, stirring and liming, all tend to help, but collectively may not be a prompt cure. Aggravated cases are not cured by putting a tank out of service for months. In some tanks sludge removal from the bottom affords a remedy, but this is not available for tanks containing most of the solid matter in a floating condition. The surest remedy then is to remove the great bulk of floating solids from the gas vents until only small quantities remain. Obviously such removal must be done in a way to minimize offense.

14. Scum storage for floating solids above the elevation of the slot should be provided for much more liberally than hitherto for small plants, expected to receive during the first year of their operation a substantial proportion of their normal daily quantity of sewage.

15. Scum removal may be necessary in some plants even where there is fairly liberal allowance for scum storage. It depends partly on intensity of gasification, partly on the adhesiveness (gas-retaining capacity) of the scum, and partly on the success attending efforts to make portions of the sludge remain in the lower part of the digestion chamber. In aggravated cases, scum removal is imperative, but it should be carried out with caution.

16. Scum prevention comes about in some degree through comminution incident to pumping and may be further aided through the use of screens. Sometimes screening is provided in front of pumps. At Rochester, N. Y., the flow of a gravity outfall sewer now passes through a fine screen on its way to Imhoff tanks. Similar provision has been recommended at Plainfield, N. J. Such a step adds materially to the cost of sewage treatment, but evidence at Reading, Philadelphia and Chicago, shows that it reduces scum formation to a substantial degree. Its advisability for a given project depends upon whether the need is commensurate with the cost.

17. Normal Imhoff sludge is dark-colored, practically inodorous and shows a curdled appearance when it flows in a thin layer down the side of a container. Much difficulty with odor has followed the withdrawal of undigested sludge to a drying bed and an operator should carefully note the condition of the sludge before and during its removal. But difficulty has also resulted from retaining sludge for a year or more in a tank under conditions where suitable enzyme digestion does not prevail. Such sticky gray or yellowish sludge may be foul-smelling, but it is wisest in some cases to remove it, with greatest care taken to prevent nuisance from odors. Complete digestion is not always attainable.

18. Sludge storage capacities are provided for more liberally than formerly and with good reason. It is not unusual to find extremely thin or dilute sludge in a digestion chamber and this high water content is quite a factor in causing a demand for larger sludge chambers. Another item is the relatively long period of cold weather during which little or no sludge can be removed. This applies particularly to northern plants put in service during the late summer or fall.

19. Sludge beds should be at least double the areas recommended by Dr. Imhoff, due to the frequency and intensity of rainfall in our northern States—unless covers of the hot-house type should be provided.

20. It is well to empty idle tanks and conduits; otherwise offensive odors may ensue.

#### CHLORINATION.

Mr. Fuller's experience leads him to the conclusion that chlorine devices, if kept in service uninterruptedly, make more of a demand on the operator than was expected a

few years ago. Duplicate parts are needed to a substantial extent and it would be preferable to have complete duplicate devices for small plants. Another important point for the operator who seeks efficient chlorination at all times is to see that the minimum dose applied is sufficient to do its work when the fluctuating sewage requires its maximum dose; subject, of course, to reasonable adjustments as between day or night flows, and discharge of trade wastes, if such are a factor.

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#### KEEPING CONNECTICUT ROADS OPEN.

Connecticut now has a law requiring the Highway Commission to keep the state roads open at all times of the year, and the conditions of the winter now departing have given the commission a strenuous time in endeavoring to comply. One of the most important of the highways is the Boston Post Road, from New York through Bridgeport and New Haven. The keeping of this road clear of snow was the duty of R. M. Donnelly, commissioner of repairs.

The snow on this stretch was removed by use of four motor trucks equipped with adjustable snow plows. The two larger of these trucks were built in Bridgeport. The plow blades are of steel and are 10 feet long and 14 inches wide. They are hung on a semi-circular steel frame which is operated from the seat of the truck by a hand wheel and heavy chains. With this arrangement it is possible to set the scraper blade to either a right or left hand angle so the snow can be plowed either toward the center of the road or toward the gutter. There is an automatic blade release so constructed that when the cutting edge strikes an obstacle such as a manhole cover or car track the blade releases to pass over the obstacle and then immediately returns to its operating position.

In clearing the highways in the country, two trucks are used in tandem formation and about a block apart to obviate the danger of absolutely blocking all traffic behind. The truck in the rear follows to the right or left of the forward truck, catching up the snow in its wake and throwing it and the snow untouched by the first truck further to the side of the road. After the heaviest snow storm, these trucks cover a minimum of 30 miles in a working day, clearing the road for a width of 18 ft. and averaging from 3 to 3½ miles on a gallon of gasoline. It has been found that the larger trucks of high power are by far the most efficient in this work.

This method of clearing the state highways has proved a complete success and is the cheapest method yet discovered of dealing with the snow problem. It is surprising to learn what a large effect the hills have on the cost of this work. Near the city of Bridgeport, where the country is flat and the hills are few, the cost was \$7.50 per mile; while when operating on the hills in and near Greenwich the cost was between \$30 and \$40 per mile.



SNOW REMOVAL ON CONNECTICUT ROAD.



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## THE SUPREME WAR CONSERVATION.

Food, munitions, ships, money and men: these are the essentials to the work in which all the efforts of patriotic Americans are centered and must be for months or years to come. Food production can be and is being increased greatly; that of munitions and ships has in a few months grown to enormous proportions. As to money, this country contains thousands of men who can say: "Making money is the easiest thing I do."

But men—strong, husky, virile, brave men—we need not only for fighting, but also for producing all the other necessities. In proportion as we lose men, we will fall behind in every phase of our war program. From now on, every loss of an effective man, either here or "over there," weakens the punch of our fighting line.

Conservation of food, of fuel, of ships, of money is a universal duty that has been brought home to all of us. But back of all these is the duty to conserve men. Given the men, waste or loss of these other things can be replaced in a few months. But if man power fails us, the Almighty himself can not replace the loss inside of eighteen or twenty years, and by that time the war—or civilization—will be ended.

Conservation of men, therefore, is the supreme duty. Since new workers can not be created, everything depends on saving the lives of those we have; and that is better also, since we save not only the man, but also his training and what it has cost.

But saving lives is not the only possibility open to us. Lives are of value to the nation only as they represent useful work done, and we must preserve and even increase the ability to perform such work. A worker full of health and vigor is easily worth two sickly ones, and to

the extent that we prevent or remove sickness we in effect provide two workers where there was but one before. If but one-fifth of the workers are brought from the sickly to the vigorous class, we thereby add ten per cent to our man power.

If the above is true—and we do not see how it can be questioned—then those entrusted with the directing of public affairs and the expenditure of public funds have imposed upon them no duty more imperative than that of maintaining and improving sanitary conditions wherever it lies within their power. More than ever, preventable sickness and deaths in any community are a disgrace to that community; they are more, they are a crime against the country.

Public works that use labor, materials and money unnecessarily should be halted until the war is won. But among these can not be classed those that contribute to the health of the community. Safe water must be provided, its purity being guarded until it reaches the consumer; and by sewage and refuse removal the dangers connected with the retention of these matters in communities must be eliminated. Every efficient man is worth \$10,000 to the country just now, and it costs that much to kill one of the enemy. There are few cities that can not, by improving their sanitary conditions, save several lives for every \$10,000 spent. And the use of labor, materials and money for the saving of those lives is the most important aid to the country that our cities can render at this time.

## —Buy War Saving Stamps— MUNICIPAL BONDS.

According to the "Daily Bond Buyer," of New York, the sales of municipal bonds during February totaled nearly two million dollars higher than during January, or a little under twenty million dollars. This is the more encouraging because only twice during the past ten years has the February total exceeded the January, and on the average during those years the February sales totaled forty per cent less than the January. The sales last month were about seventy-five per cent of the average for the last ten Februaries.

Not only did the sales increase, but the prices were better than a few weeks ago. Apparently the chief factor in causing the improved condition is the feeling that the supply of new bonds this year will be materially reduced as a result of the influence of the Capital Issues Committees, at least issues of \$100,000 or more. "The feeling is growing that, if the supply of these tax-free and trouble-free bonds is reduced in any material amount, values will improve in spite of new Liberty Loans carrying higher interest rates."

## —Buy War Saving Stamps— GARBAGE UTILIZATION AT HOME.

Much has been said by us and others recently concerning the utilization of garbage by turning it into pork products. Pig-raising for this purpose has been treated as a community project, for two very good reasons; first, because it is so difficult to prevent the individual pig-pen from becoming a nuisance in a thickly settled district; and, second, because a single family does not (or should not) produce enough garbage to feed even a single hog.

It seems to be impracticable, as well as wasteful, to burn garbage in the range of the home without both difficulty to the one operating the range and also the emission from the chimney of odors objectionable to the neighbors.

Any one who has a reasonably large yard at his disposal, however, can utilize his garbage, whatever the amount, by feeding it to chickens, and thus transform it into eggs and meat. And only reasonable care is necessary to pre-

vent the raising of chickens from causing any objectionable odors, and few cities or towns have ordinances against it. It is true that some additional food must be purchased, but chickens will eat to advantage all the ingredients of fresh garbage, and if the number kept is maintained at that which can profitably dispose of the average amount of garbage available, the returns from the chickens will much more than repay both the cost of food purchased and the few minutes a day devoted to the care of them.

Like growing a back-yard garden, the raising of chickens will be profitable only if intelligence is used, care is taken to learn the proper methods, and systematic attention is paid to the work. But, also like vegetable gardening, chicken raising will be a patriotic food measure as well as profitable. Incidentally, the chickens will furnish a fertilizer that will be of no inconsiderable value in the gardening.

The United States Department of Agriculture will, at your request, furnish you with instructions for back-yard poultry keeping.

— Buy War Saving Stamps —

### WAR DEPARTMENT FAVORS ROAD CONSTRUCTION.

A few weeks ago, Wm. Sohler, chairman of the Massachusetts Highway Commission, received, in reply to an inquiry addressed to the War Department, an answer from Major Gen. W. M. Black, chief of engineers, in which appeared the following paragraphs:

The requirements of a military highway do not differ in any material respect from those of a highway for modern commercial purposes. The character of the roadbed should in general be the same as for modern commercial highways, and in general a road designed for modern commercial purposes would serve well for military purposes. In practically all cases roads which are valuable in a military way are those connecting important commercial centers.

As to the question of what military roads must be prepared to carry in the way of traffic, it may be stated that our existing ordnance liable to accompany a field army will have its heaviest representative in a twelve-inch howitzer, weighing about 27,000 pounds, 18,600 of which are on the front wheels and the remainder on the two back wheels. The wheel base or distance between the front and rear axles is eighteen feet; width of truck, seven feet four inches; width of tires, eight inches; width of tire shoes, twelve inches. This howitzer is to be drawn by a seventy-five-horsepower caterpillar tractor, weighing about 25,000 pounds. Comparison with the largest commercial trucks shows that a road substantial enough for such will suffice for the ordnance load.

Another army authority, Major Gen. Leonard Wood, says regarding military roads:

A systematic, well-planned network of roads which can be regularly used commercially is not only a good investment, but may be of tremendous value to our military forces. While hastily or improperly built roads should not be rushed at this time on the chance that they might be of some strategic value to our armies, substantial highway construction of economic value should not be curtailed because we are at war. Through routes connecting centers of production or population aid in the prosecution of the war by providing additional facilities for transportation of men and supplies.

To be of value to armies in campaign, roads should be paved for a width of not less than eighteen feet and preferably twenty feet, and the total width between inside edges of ditches should be at least thirty feet. This will provide for two lines of motor trucks, and allow a space on either side for emergency repairs of broken-down vehicles or the movement of troops. Low grades are, of course, very desirable.

In conclusion, I would urge consideration of road construction, particularly in those localities where important fortifications exist with no first-class connecting road. No one can foresee the outcome of the present crisis, nor those crises which may follow. These matters of preparedness

which can not be handled overnight should be considered well beforehand.

— Buy War Saving Stamps —

### CITY TO RENT TRACTOR.

The city of Sacramento, California, proposes to rent out the tractor that it owns when it is not being used on city work. It will ask a rental of \$25 per day or \$3.50 per hour for the services of machine and operator. The city commissioner made this decision a few days ago on recommendation of commissioner of streets D. W. Carmichael.

— Buy War Saving Stamps —

### FEEDING CITY GARBAGE TO HOGS

#### Information and Instructions Furnished by the U. S. Department of Agriculture—Feeding Garbage—Diseases of Pigs—Plant Layout.

The United States Department of Agriculture is studying the matter of feeding city garbage to hogs, including the best method of handling, feeding and fattening stock, the most efficient and sanitary arrangement of equipment, the comparative value of garbage as a hog-ration, and the economy of garbage disposal by feeding to hogs as compared with incineration, reduction, dumping, or burying. As a result of a preliminary investigation, it has issued circular No. 30 dealing with the subject and having the title "Disposal of City Garbage by Feeding to Hogs," copies of which may be obtained from the Division of Publications of the department. This circular consists of eight pages of reading matter and a proposed plan for a pig-raising farm or plant. This plan we reproduce herewith, and give below a fairly complete abstract of the text.

While many people recognize in hog-feeding the possibility of a cheaper disposal of garbage than by reduction, incineration, or dumping, there is no reliable and complete source of information on the subject. The report of a special commission on the "Collection and Disposal of Municipal Wastes" for Worcester, Mass., shows the cost per capita per annum for the collection and disposal of garbage in 17 cities of the United States. Seven of these feed their garbage to hogs, while the other ten dispose of it by other methods. The average cost per capita per annum for those feeding garbage was about 11.6c, and the average cost for the other ten was about 33.7c. If these averages should be confirmed by reports from a large number of cities, it would seem that using hogs as garbage converters would save directly to the cities of the United States enormous sums of money and add greatly to the meat supply of the nation. At no time in our history has the elimination of waste been a more emphatic necessity than at present. Entirely aside from the economy effected, if the garbage produced in cities and towns can be used profitably in pork production, every effort should be made to convert it to this purpose.

The report states that sufficient analyses have not been made to warrant a definite statement regarding chemical composition or feeding value of garbage as compared with grains or commercial foods. While garbage-fed hogs sometimes are docked from one-quarter cent to one cent per pound in the eastern markets, this discrimination is not universal. It is a frequent observation that hogs fed exclusively on garbage or swill have a softer and more oily flesh than grain-fed hogs. Decayed or badly fermented garbage is likely to cause strong and rancid pork. But if garbage is fed in good condition with proper surroundings, there is no reason why pork from



this source should not compare favorably with that from grain-fed hogs.

The report contains some information concerning the collection of garbage, all of which is familiar to readers of Municipal Journal. As to the quantity of garbage consumed, it states that approximately 15 to 25 pounds of garbage per day are required for growing a hog of 125 to 200 pounds, depending upon the character of the garbage. It has been estimated that four tons of garbage are required to grow a pig to 200 pounds, the feeding period extending over 10 to 12 months.

A common practice in feeding is to dump the garbage on feeding floors as early as possible in the morning and admit the fattening hogs to it. These are permitted to remain until the afternoon, when the sows and young stock enter and clean up the floors during the night. In the morning, the feeding floors and sleeping quarters are cleaned of refuse garbage and manure before the fresh garbage is unloaded. This refuse may be disposed of by placing in compost piles or by spreading upon the land at once. The former method is very satisfactory; if the latter is employed, the material must be plowed or covered promptly or it will soon become a nuisance.

#### COOKED VS. RAW GARBAGE.

The cooking or sterilizing of garbage is good practice because it makes possible the separation of the grease contained, which some feeders claim does not add to the feeding value and is in part injurious to the hogs. This grease is sold for from 10 to 14 cents per pound and in the larger establishments is an important source of income. Cooking also removes all danger of infecting hogs with disease germs or parasites, such as tubercle bacilli and trichinae. On the other hand, cooking is an expensive operation and is regarded by many successful feeders as useless and even injurious, partly owing to the formation of organic acids. Cooking the garbage causes all the material contained to be so thoroughly mixed that it is impossible for the hogs to practice selection in eating. The argument is advanced that a hog will balance his ration on raw garbage, whereas if the material is cooked he is compelled to eat everything without regard to his appetite. It would seem from the information obtained thus far that cooking is not essential in summer if garbage is clean and is fed promptly. However, the practice is advisable in winter, when the garbage contains a higher percentage of grease which can be removed in the cooking process. When a part of the garbage is frozen, cooking renders it more palatable and available, at the same time making it possible to supply young stock with warm feed.

#### RELATION TO DISEASE.

Garbage-fed hogs are exceptionally free from lice and intestinal parasites, and when fed upon sterilized or cooked garbage they have been found to be as free from disease as other hogs bought in the open market. Some feeders have reported a very low percentage of tubercular or trichinae-infested hogs where only raw garbage is used, while in other instances pronounced tubercular and trichinae infestation has been found. It is a noteworthy fact that hogs are very susceptible to bovine tuberculosis, and therefore it is unsafe to feed raw garbage which contains milk from any but healthy cows. Similarly, while it is true that numerous garbage-fed hogs have been found to be free from trichinae, if garbage contains raw pork scraps, the hogs feeding upon that garbage are sooner or later sure to become infected, as statistics have shown that 1.4 per cent of all hogs slaughtered in the United States carry the trichina parasite in some stage. Therefore while it might be possible under the most careful and sanitary measures to feed raw garbage with

freedom from disease and parasites, still as a precautionary measure sterilization or cooking is advised.

Owing to the nature of the feed, garbage-fed hogs require very careful protection from cholera. Unless the premises are kept in the most sanitary condition and all refuse food is collected and disposed of carefully and promptly, cholera is likely to cause serious loss. However, with proper sanitation, inoculation, pure water, and exercise, cholera need not cause serious loss.

The presence of dishwater in garbage usually results in digestive and intestinal disorders caused by the alkali washing powders. Frozen garbage should never be fed, as it usually causes death to the animals consuming it.

All glass should be removed, if possible, to prevent slitting of the intestines.

Decayed or fermented garbage will cause serious digestive disorders if fed in appreciable quantities.

*Treatment for Cholera.*—The majority of eastern feeders practice the simultaneous treatment for cholera vaccination which may be accounted for by the fact that the premises are thoroughly infected with hog-cholera germs. Under the most sanitary practices the single treatment may be sufficient to keep the herds free from disease. If the feeder observes signs of an epidemic, the premises should be cleaned immediately, disinfected, and all animals from 2 to 3 weeks up, vaccinated.

#### BREEDING STOCK.

It is a current opinion that "garbage-bred" stock is essential to a successful feeding establishment. Grain-fed stock is subject to digestive disorders when transferred to a garbage ration. The most successful feeders usually maintain their own herds of breeding stock and in this way their pigs are raised upon and thoroughly adjusted to a garbage ration when the fattening period arrives.

Separate breeding and farrowing quarters should be maintained for sows. A very high mortality among weanling pigs has been noted by eastern feeders. This is probably caused by their digestive systems being less resistant to the effects of cold and damp quarters. The first litters are considered the poorest, while the second and third are somewhat better. How long stock should be retained in the breeding herd depends upon the individual merit of the animals and the personal opinion of the breeder.

#### EQUIPMENT.

Garbage-feeding enterprises vary widely in equipment and in plan of operation, depending upon the size of the adjacent city, the amount of garbage collected, the number of hogs fed by each individual, local sanitary regulations, and the ideas of different operators. No well-established standard is in use, as regards either equipment or plan of operation.

In the larger and more efficiently arranged plants, the feeding pens are placed side by side, fronting a central driveway, through which the garbage is hauled. That part of the pens adjacent to the drive should be built with a concrete feeding floor upon which the garbage may be thrown. Generally this floor is surrounded with a rim to keep the garbage upon the floor. Some feeders prefer troughs. In either case the concrete flooring is of much assistance in keeping premises properly cleaned and free from rats. Plank flooring may be used, but as it becomes worn the nailheads protrude and cause difficulty in scooping up refuse, cracks appear, boards are broken, and garbage collects under the platform, causing odors, vermin, and disease. In addition, the platform affords an ideal harbor for rats.

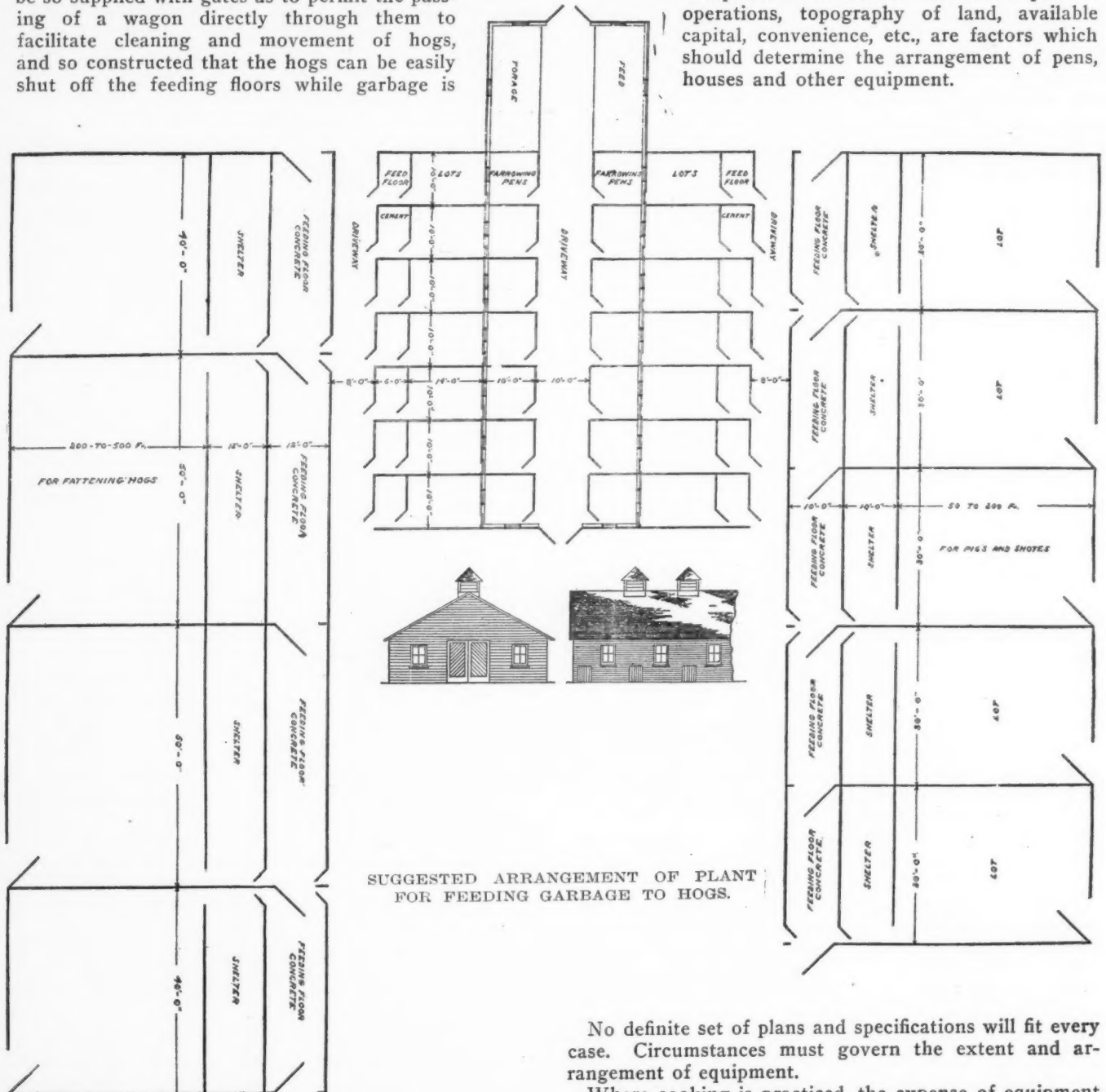
The pens should front from 10 to 40 feet, depending upon scale of operations, cost of construction, value of

land, and age and character of stock. A greater number of mature hogs than of pigs may be kept together without increasing the danger from disease. The sleeping quarters may be constructed just back of the feeding floor and in this way the refuse garbage and the manure from the hogs may be collected at one operation. Each pen should be supplied with a lot or, if possible, a pasture. This furnishes a place for exercise and in some cases it may be possible to supply the hogs with a crop of rape, soy beans, or some other green forage. The pens should be so supplied with gates as to permit the passing of a wagon directly through them to facilitate cleaning and movement of hogs, and so constructed that the hogs can be easily shut off the feeding floors while garbage is

hogs and brood sows in larger numbers than are safe in the case of young stock.

The farrowing pens and lots are arranged between the lots for other stock. For a large establishment this plan is very convenient, but if hogs are purchased and fattened and no stock raised, the central building can be omitted and the fattening pens built on each side of a central drive. The farrowing pens can be built at any convenient place about the premises.

The plan is not intended to fit every case, neither is it complete in all details. Scale and plan of operations, topography of land, available capital, convenience, etc., are factors which should determine the arrangement of pens, houses and other equipment.



being dumped on and again while floors are being cleaned.

In the plan shown, it is sought to arrange gates so that wagons may pass across feeding floors of all but those of farrowing pens in order that the floors and the shelters may be cleaned at the same trip. Also gates are provided to keep animals off floors while garbage is being unloaded, and also during the cleaning process. The pens for fattening hogs and young stock are of various sizes, because it has been found practicable to keep fattening

No definite set of plans and specifications will fit every case. Circumstances must govern the extent and arrangement of equipment.

Where cooking is practiced, the expense of equipment and operation is increased considerably. In some of the smaller establishments live steam is piped to the bottom of ordinary covered barrels or vats and released. In larger plants, boilers of considerable size are used, and these with the necessary accompanying equipment frequently cost from \$400 upward. The total cost of equipment for a garbage feeding plant may vary from a few hundred dollars to ten or fifteen thousand, depending upon methods of construction, materials, and scale of operation.



## The WEEK'S NEWS

**Lincoln Highway as Military Road—State Highway Developments in Montana, Nebraska and North Carolina—Connecticut's Public Health Nursing Plans—Government Hydroelectric Plant at Muscle Shoals—Rate Increases in Seattle and Indiana and New York Cities—Fires in Lancaster, Tex., and Pittsburgh, Pa.—Federal Control of Municipal Financing—Traffic Regulations for New Jersey Cities Under State Supervision—Educational Campaign for Highway Safety.**

### ROADS AND PAVEMENTS

#### Army Officers Confer on Lincoln Highway.

Detroit, Mich.—A conference has just been held here at the national headquarters of the Lincoln Highway Association between the officers of the association and a party representing the Quartermaster's Corps, U. S. A., the Engineering Department, U. S. A., and the Highways Transport Committee of the Council of National Defense. Mr. Raymond Beck, who has been conducting a special investigation of road conditions in the middle west for the Highways Transport Committee of the Council of National Defense, Capt. C. B. Butchers of the Engineering Corps, and Major Uhler of the Quartermaster's Department have comprised the official party investigating road conditions between Chicago and the Atlantic Coast with a view to the ultimate extension of the motor transport plan of the Quartermaster's Department. With the opening of the roads this spring it was apparent that a tremendous volume of freight would be moved over the important main highways of the east and middle west. A day was spent by the army officers and Mr. Beck in going over conditions on the Lincoln Highway as they now exist in Illinois, Indiana and Ohio. A report of the results of their investigation will be made to the Highways Transport Committee of the Council of National Defense. In November of 1917 a letter was sent from the Council of National Defense to the various states through which the Lincoln Highway passes urging the immediate improvement and constant maintenance of that road for possible truck transport service. Many of the states have taken prompt action to bring about needed repairs and improvements and the official party mentioned has been checking over conditions on the Lincoln Highway and will extend their investigations possibly as far as the Mississippi river.

According to a statement by president F. A. Seiberling of the association "the government, through the Council of National Defense, has urged in every state the rapid improvement of the Lincoln Highway. The effect of local political conditions and the inevitable local selfishness, which in normal times has controlled and hampered proper road improvement in every section of the country, will this year, in view of the obvious national necessity for the concentration of effort and funds upon our truly national roads, be eliminated."

#### To Begin Work on Montana Highways.

Helena, Mont.—Field equipment has been ordered by the state highway commission for the survey parties that will shortly be placed in the field to make the final surveys on twelve projects that have been definitely approved by the commission. The aggregate mileage of these projects is 142.75 and their cost \$317,304. Meantime, the preliminary details are being worked out on eighteen other projects and it is expected that by the time the first twelve are ready for construction in the spring, surveys can be completed on the remainder. Some of these projects involve new construction or relocation, but the majority contemplate surfacing, installation of drainage and some grading. If the commission had only automobile traffic under consideration in its road program, short grades as high as 12 per cent would be permissible, but as it is giving its endorsement only to projects that are primarily used for farm traffic, it is desirable to keep all grades below 8 per cent. There are grades said to be as high as 20 per cent on some of the well traveled roads of Montana. Because of the

prohibitive cost of transporting surfacing materials long distances, the commission will utilize the best available material in the locality of the project. It is now making a study of the surfacing materials that are to be found in various parts of the state. Gravel will be used where possible; in eastern Montana scoria will be utilized, and in some instances it will be necessary to use a mixture of sand and gumbo. A federal highway engineer will shortly inspect these twelve projects in person, and after they have received his approval the reconnaissance maps and the preliminary statements outlining the projects go to Washington for approval. Then the final surveys will be started. Montana was recently transferred from the Denver to the Portland federal district, in charge of L. I. Hewes. It is possible that along with these twelve projects there will be submitted for federal approval a \$25,000 project in Rosebud, a \$10,000 project in Big Horn, and an \$80,000 project in Yellowstone county.

#### Contractor Wins Against Detractor of Job.

Chicago, Ill.—John A. McGarry & Co., paving contractors, has won a judgment for \$2,500 against C. B. Harter. The suit grew out of statements made by Harter, who is secretary of the Wakeford Improvement club, at a meeting of the Chicago Lawn Improvement club, in which he charged that McGarry had installed bad pavement which did not meet specifications on certain streets. The case was aired back in June, 1915, when Harter and others undertook to prevent the local improvement board from approving the \$100,000 paving bill submitted by the McGarry company. Harter at that time charged that McGarry had violated practically every clause of the specifications.

#### Not to Use Convicts on Road Work.

Lincoln, Neb.—The state board of control, through a communication prepared by Judge Holcomb, member of the board, announces that it will not at this time submit any proposition to county authorities with the view of using inmates of the state penitentiary to work on public highways. The board, after deliberation, finds itself unable to discover any plan which it deems would be practical as contemplated by action of the last legislature. It does not believe, with the conditions surrounding the state, the use of convicts in road making, and especially in improvement of the dirt roads, can be brought about successfully. It, however, believes that if the convicts could be used in some line which would make the penitentiary self-sustaining, it should be done.

#### Good Attendance at Road Institute.

Chapel Hill, N. C.—The fifth road institute recently held at the University of North Carolina was one of the most successful yet held, both from the standpoint of large attendance and interest in the meeting. There were in attendance at the institute 122 road officials from forty-nine counties. J. S. Bailey, of the Portland Cement Association, lectured on "Late Developments in Concrete Construction." The lecture was illustrated by lantern slides, showing the method of construction of concrete roads. The next meeting opened with a talk by Prof. T. F. Hickerson of the civil engineering department of the university and member of the state highway commission. He discussed "Some War Problems in Comparison With Road Work." Ira B. Mullins, testing engineer of the state highway commission, gave the results of a long study of the efficiency of sand-clay materials. D. H. Winslow, engineer in charge of maintenance for the state highway commission, talked on

"Road Maintenance under the New State Maintenance Law." H. K. Bishop, district engineer for the U. S. Office of Public Roads and Rural Engineering, spoke at length on the federal road act.

## SEWERAGE AND SANITATION

### Disease Prevention Ordinance Follows U. S. Request.

Denver, Colo.—The recommendations of the U. S. Public Health Service regarding the protection of soldiers and sailors from venereal disease have resulted in the passage of an ordinance designed to enable the officers of the city to exercise stringent and effective control of possible sources of infection. Patients, doctors, hospitals and druggists must notify the Manager of Health and Charity of any case coming to their attention within 48 hours, giving correct details. All reports made to the manager shall be his confidential record and shall not be open to public inspection. The penalty for violation is \$300 or ninety days' imprisonment, or both.

### Helping the Doctors Report Births.

Columbus, O.—To insure the accurate collection and prompt forwarding of data for birth certificates, Dr. J. E. Monger, state registrar of vital statistics, has recently prepared a pocket-size book for the recording of this information. A copy of this will be given to any physician upon application to his local registrar of vital statistics. Local registrars are supplied from the state registrar's office.

### Public Health Nursing in Connecticut.

Hartford, Conn.—The general need of more public health nurses in this State has been recognized by the state department of health for some time, and it has also been known that public health nursing service was an urgent necessity in certain localities. A recent survey by Miss Helen Boyd has placed in the hands of the department information and data of great value. Miss Boyd was sent to this state by the nursing committee of the General Medical Board of the Council of National Defense at the request of this department. The report says:

"More important than the care of the sick, necessary as it is, is the preventive work that the public health nurse can do. The visiting nurse associations do not report an abnormal increase in their work this year—that the over-crowding and the high cost of living has not induced acute illness needing the visiting nurse, does not mean that people's resistance is not being steadily reduced. It is against the insidious working of these conditions that the nurse can make headway by teaching the people in their homes how to live and what to eat.

"The tuberculosis problem in the state is well cared for when compared with other states. That sanatoria are provided with more beds per population than other states does not mean, however, that there is not a great deal of follow-up work which should be done. The patient, before he goes to the sanatorium and after he comes back is sadly neglected in the greater part of the state.

"The result of keeping the children safely at school is one great feature of school nursing. Another is prevention of epidemics. A school nurse early learns to note suspicious symptoms and can immediately send a child to the school physician for diagnosis. A large population of foreigners whose standard of living is such that every means in our power should be used to teach them hygienic living.

"There are ninety-nine nurses doing industrial nursing in the state of whom eleven are not graduate nurses. The work of a nurse in a factory is altogether too responsible for an undergraduate.

"That the State of Connecticut is ready to develop public health nursing cannot be doubted. In the twenty-three towns visited, nine had definite groups who were interested. In three, the money had already been raised to support a nurse. Thirteen already had nurses. One of the thirteen was just starting a second welfare station. Only one town was apathetic. A public health nurse under the State Commissioner of Health would be of invaluable service in encouraging, directing and helping these communities who are so anxious to go ahead with public health nursing, but have so little knowledge of the subject. This expert advice could easily be given to them by a state supervisor of Public Health Nursing."

The public health nurses in Connecticut are classified as follows: General visiting nurses, 107; infant welfare nurses, 15; tuberculosis nurses, 14; school nurses, 50; industrial nurses, 99; total, 285. There are forty-two towns with public health nurses and 126 towns without any such service. This large number of towns without public health nursing service in itself shows the need of many additional public health nurses. The report has carefully estimated that 233 additional nurses are necessary to properly equip the state.

## WATER SUPPLY

### City Need Not Pay For Fountain Water.

Columbus, O.—Claims by the bureau of supervision of public offices, department of auditor of state, that cities must pay for water furnished in street troughs and fountains by municipal water works, are wrong, according to an opinion by the attorney general's office. He says the council may order such water furnished free, just as it is furnished in public buildings. The ruling affects practically every city in Ohio having municipal water works.

### Electric Company Contracts to Thaw Water Pipes.

Sandusky, O.—The city and the Sandusky Gas & Electric Company have signed a contract whereby the company is to be paid \$15 per service for thawing out frozen water pipes up to and including 1½ in. in diameter. For each ½ in. increase in size of pipe above 1½ in. \$1 additional is charged. This price covers the customary work of the company. Where an extension of more than 200 ft. is required \$1 extra is charged for each additional 100 ft. of service extension. In addition, the city furnishes the necessary vehicle to convey the equipment from place to place and an experienced waterworks man to look after the water piping. The city makes all arrangements with the customer and makes collections, and the company bills the city each month for the service rendered. The average time required to thaw out an ordinary service after the current is applied is about eleven minutes. This does not mean a substantial profit to the company, but a considerable saving to the city, for were it not for this system being employed, in many instances it would become necessary to take up the pavement in the streets in order to thaw out the frozen pipes by other methods.

### Commission Declares Company's Rates Unreasonable.

Guilford, Me.—The state public utilities commission has decreed that the schedule of rates of the Guilford Water company filed with the commission and which was suspended until February is unreasonable, unjust and unduly and unlawfully discriminatory and is not permitted to go into effect. The company is ordered to refrain from charging rates in excess of those in effect by the company upon and immediately prior to August 29, 1917. The Guilford Water company is forbidden to charge its customers until after April 1, 1918, any other or different rates than those in the present schedule. The company must file with the commission, on or before March 20, 1918, a new schedule of rates effective April 1, 1918. If prior to the filing of schedule the town of Guilford must modify its existing contract with the company so as to provide for an additional payment to the company of \$300, then the rate to be charged to first faucet customers for service, the minimum rate to be charged for any single service and the rate to be charged to stores and business places not requiring more than ordinary supply of water, shall be \$7. If, however, prior to the time indicated for the filing of the new schedule the town of Guilford shall not have so modified this contract, then the rate to be charged to the above-named takers and shown in the schedule shall be \$7.50. Last August the company filed in the office of the commission, to become effective on and after October 1, 1917, a change in its existing rates for service. The rate for the first faucet, which had been \$6, was to be increased to \$8 per year; the rate to stores and business places was to be increased from \$6 to \$8, and the rate of \$200 charged to the Bangor & Aroostook railroad was to be increased to \$250. This latter increase is understood to have been brought about by an agreement between the two companies. While the amendment to the schedule which would bring about these increases was properly filed with the commission on August 29, and while such filing constituted all the notice of the change which the company was by law obliged to give, nevertheless the inhabitants of Guilford did not receive any actual notice of the proposed change until the very last part of September. Upon obtaining the information the board of selectmen requested



the public utilities commission to suspend the tariff pending an investigation.

## STREET LIGHTING AND POWER

### Government to Construct Big Hydroelectric Plant.

Washington, D. C.—President Wilson has signed the order authorizing the construction of the first and largest of the dams on the Tennessee River proposed a few years ago as the Muscle Shoals hydroelectric development. The plans are to be worked out with funds derived from the appropriation for a government nitrate plant which was made by Congress in 1916, and the hydroelectric plant when completed will become a part of the two nitrate plants now being built near Muscle Shoals at Sheffield, Ala. These two plants are a factory for the fixation of nitrogen which will produce approximately 20,000 tons of ammonium nitrate a year and will be owned and operated by the United States and a plant owned by the United States but operated by the Air Nitrates Corporation, which will produce 110,000 tons of ammonium nitrate a year.

### Big Raise in Seattle Gas Rates.

Seattle, Wash.—An order increasing the gas rates for the city of Seattle approximately 25 per cent has been issued by the public service commission at Olympia. The new schedule granted to the company is higher than the proposed scale of increases asked by the company several months ago when it filed its schedule with the commission. The committee abolished the readiness-to-serve charge, but increased the minimum from 25 cents to 60 cents. The new rates will increase the revenue of the Seattle Lighting company \$290,000.

### Proposed Utility Company Must Have Proper Capital.

Groton, N. Y.—The state public service commission for the second district recently handed down a decision on the request by the Groton Electric Power Corporation for permission to construct a plant to serve Groton and nearby communities. The commission ruled as follows: "An electric company applied for permission to construct and for approval of franchises in certain villages and towns where there is a decided need for electric service. The company was not yet fully organized as a corporation. It had filed its certificates, but had obtained no authorization for capital stock from this commission. In the circumstances it was held that the application should be granted, but that no construction should be undertaken until proper capital authorization from the commission should be secured."

### New Gas and Electric Rates.

Middletown, N. Y.—The Public Service Corporation of Port Jervis and Middletown has now in effect the following new rates for electric light and power and gas in this city: Gas—\$1.25 for each 1,000 cubic feet up to 20,000; for the next 10,000 up to and including 30,000 cubic feet, 75 cents per thousand feet. Electric light and power—10 cents per kilowatt hour net; if in a month the amount used exceeds \$25, 10 per cent discount; over \$50, 20 per cent discount.

### Three Cities to Pay More for Gas.

Kendallville, Ind.—The Indiana public service commission has entered an order, as a war emergency measure, authorizing the Indiana Fuel and Light Company, which operates plants at Kendallville, Garrett and Auburn, to increase its schedules of gas rates during a period not to exceed two years. There were no protests from any of the cities represented in the petition, but the commission did not grant in full the company's petition, which asked for a permanent increase in gas rates. A net increase of 25 cents a thousand cubic feet was granted, bringing the new price to \$1.50 gross and \$1.40 net, while it had been \$1.25 gross and \$1.15 net before. The commission's order pointed out that the new rates may be changed at any time. The commission's engineers found the reconstruction value of the

company's property to be \$400,583, and the present value to be \$366,537, including working supplies and working capital. The company asked that \$3,791 be included in the appraisal for salaries and commission on promoting business, but the commission cut this figure down to \$1,500 and made corresponding reductions in other similar demands made by the company. The commission allowed 2 per cent, as a depreciation charge, and some members of the body felt, it is known, that this depreciation charge—which would estimate the life of the company's property at fifty years—was too low. Allowing the company 7 per cent return on its capital stock, over and above operating expenses and overhead charges, the valuation fixed would mean that for every 1,000 feet of gas sold under the old rates the company would lose 28 cents. To allow for part of this difference an increase of rates totaling 25 cents was permitted. All these figures refer to the primary rate for gas, or that charged to the smallest consumers. Corresponding figures for the other classes of consumers are set out in the commission's order.

## FIRE AND POLICE

### Fire Captain Killed in Collision.

Cumberland, Md.—George W. Miller, captain of Central fire station, was so severely injured when pinned between the department's auto fire engine and the police patrol that he died later at the hospital. The fire engine, followed by the patrol, was responding to an alarm. The engine had just stopped at the scene of the fire and captain Miller and James Finan leaped from the steps of the engine with the fire hose. The patrol, driven by William Cabbage, could not be stopped in time and captain Miller was struck by the fender of the patrol and pinned against the engine. His leg was crushed below the knee and was amputated. Immediately after the operation his condition was reported as satisfactory, but a few hours later he died. Fireman Finan, by quick action, saved himself from serious injury when he leaped back upon the steps of the engine. He was bruised and cut by the glass from the patrol's windshield which was broken by the fire ladders. According to chief of police Eyerman, the street was very dusty and the patrol was enveloped in a cloud of dust which prevented the driver from seeing that the engine had stopped. Captain Miller joined the city fire department in August, 1907, and had been in continuous service since. He was 52 years old.

### Fire Destroys Four Business Blocks.

Lancaster, Tex.—Fire recently swept the business section of Lancaster, destroying all the buildings on four blocks in the heart of the town with a loss estimated at approximately \$300,000. The flames were fanned by a strong wind from the northwest. Fire engine companies were sent from Dallas, Waxahachie and Ferris and the fire was under control only after four brick buildings, seven frame buildings, an elevator, a church, a hotel and six dwellings were destroyed. No lives were lost. The fire is thought to have originated from the burning of a pile of rubbish near a barber shop. In fifteen minutes hope of saving the group of frame buildings, of which the barber shop was one, was abandoned. A high wind blowing from the northwest carried burning embers from the barber shop across the street setting fire to a building there. The fire department was hindered in its work by a low pressure of water. Engine company No. 10 was sent from Dallas and firemen and engines were sent also from Waxahachie and Ferris. Schools were dismissed, business houses were closed, and the entire male population volunteered to aid in the work of fighting the fire while women and children carried household goods from residences which were threatened. Piles of merchandise of every description littered the square. Yards in the residence district south and east of the burning buildings were stacked with household effects. People living in houses which were in the path of the flames hurried to remove their belongings and many dwellings which did not burn were emptied of household

goods. Telephone and telegraph wires were put out of commission and the city was cut off from communication with outside points for more than two hours. Firemen strove valiantly against terrific odds to stop the spread of the flames, which threatened to wipe out the entire eastern and southern sections of the town. Bucket brigades, composed of men and boys, were formed to throw water carried from nearby wells upon the roofs and sides of houses as a protection against sparks and flying embers. Scores worked throughout the afternoon in this way and prevented the spreading of the fire to other residence sections. The flames gained headway with such amazing rapidity that persons caught in stores found it impossible to leave by front entrances and were compelled to flee through rear doors. Members of the Lancaster fire department asserted that the current which supplied the pumps was shut off three times because of live wire dangers, leaving the department without means to combat the blaze. Officials of the Texas Light and Power Company said that the power was not shut off until engines from surrounding towns reached the scene. Early in the day water supply for drinking and domestic purposes was shut off to facilitate the installation of an overhead storage tank. The business district of Lancaster was practically without drinking water during the fire. At night the city was in darkness, as the service of the power company was badly crippled.

#### Police Force Strikes—Is Fired.

Wilkinsburg, Pa.—When the police force went on strike here, chief Don Snyder dismissed the whole force. Some of the strikers called up the chief and offered to assist him should he need them. They made it plain, however, that they would act as private citizens and not as policemen. The strikers declared that burgess John Miles was entirely responsible for the trouble in the department and that they would under no condition submit to the present conditions. Burgess Miles had been invited to attend a meeting but he failed to appear. The invitation was extended to Burgess Miles "to come before this meeting and justify himself in the position he has taken in the cutting down of the police force by two men and of the discharging of certain cases that have been brought before him for trial with absolute evidence there to convict and for even refusing to hear this same evidence." The whole situation, said the men, has arisen from the refusal of the burgess to support the police department in any instance in the performance of its duty.

#### Centralizing Fire Alarm System.

Cranston, R. I.—Steps have been taken in a plan for centralizing the fire alarm system of the city of Cranston ultimately into a city-owned and city-controlled system. The city property committee decided to place the battery operating the Auburn system at the city hall. This will join up systems covering more than half the territory of the city to a central station. While it does not actually make the city the owner of the systems, it virtually places them in the city's hands. The future may see the addition of the Edgewood and Pawtuxet systems to the central scheme now to be put into operation. There have been some peculiar features about the development of fire alarm systems in Cranston. The beginning has been made in each section by the local fire company, and in pursuance of this plan the location of boxes has followed in Edgewood, Pawtuxet, Auburn, Knightsville, Cranston Print Works and Arlington. The Edgewood, Pawtuxet and Auburn systems have been entirely separate, while the Pocasset system, the first on the westerly side of the city, received the addition of the Print Works and, afterward, of the Arlington boxes. There have been four separate battery stations, with as many superintendents, these being located at Pawtuxet, Edgewood, Auburn and Knightsville. In point of territory covered, the Knightsville, or Pocasset, system was the largest. Each system except the Auburn started with a bluestone gravity battery system, the Auburn system being the first to be equipped with the more modern storage battery. In the original scheme the fire alarm boxes and inside equipment were bought by the

companies with their own funds, augmented by popular subscription, while the town of Cranston, and, afterward, the city, was asked to do the outside wiring. In this way the city was part owner of all the systems, although it did not, and does not yet, own the apparatus. In its beginning this arrangement worked fairly well. The fire companies followed the old custom of asking the city for supplies for fire alarm maintenance, receiving it in the same way that they have for years received periodical, although not regular, grants of apparatus of other kinds. The spreading out of the system, however, led to different complications, each with its reflection of neighborhood patriotism and occasionally of neighborhood feeling. The suggestion that the fire alarm systems should be centralized under city control has been made for some years, in line with the general proposal that the city should take over the entire fire-fighting service. Many difficulties arose, however. When an application was made that the city furnish a new set of cells for the Auburn fire alarm battery, to replace the set which had been in use for some years, council decided that the battery be added as a unit to the battery already operating the Knightsville and Arlington systems, the additional power being sufficient to handle the entire number of circuits.

#### Prevents Conflagration in Theatre Section.

Pittsburgh, Pa.—One of the hardest fires in the city in a long time was brought under control after three hours of difficult fighting. Originating in a small printing establishment, a series of rapid fire explosions of small vats of chemicals razed partition after partition, floor after floor, until four blazing stories of the building, surrounded by valuable property on every side, threatened the entire block with destruction. For a time it looked as if the theatre section would be the scene of a conflagration. Within ten minutes after all the downtown companies were in action, together with trucks from upper Fifth avenue and the Northside, first alarm totalling fifteen. As company after company came to the scene and the flames apparently were sweeping uncontrolled, theatre audiences of four different houses became alarmed, but were calmed by announcements from the stages that the theatre zone was isolated by a wall of water. A little force was needed when several families in Scotts way, which was endangered for a while, refused to vacate their homes. A number of firms suffered considerable loss. Dominick Newmyer, a fireman of Company 33, was overcome by fumes on the seventh floor of a building adjoining, from which a barrage of water was being maintained, and taken to the hospital. The fire, in the center of a group of buildings, was extremely difficult to locate and then to attack. Every building and structure surrounding the flames was strung with hose.

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## GOVERNMENT AND FINANCE

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#### Federal Committee to Pass on Bond Issue.

Washington, D. C.—Every municipal bond issue of \$100,000 or more hereafter will be passed on by the Federal Reserve Board's capital issues committee before being floated. By reducing from the proposed \$250,000 limit to \$100,000 the minimum size of municipal issues which it will consider, the committee extended its influence over several times more municipal bond issues than heretofore. The committee found recently, after analyzing pending applications for approval of proposed issues, that the great bulk of municipal bonds was offered in blocks of less than \$250,000 and therefore were not subject to the committee's restrictive influences. Federal reserve agents of the twelve reserve banks, who also act as chairmen of the subcommittees of the capital issues body in their respective districts, were recently in Washington for a conference and the general operation of the new voluntary system of regulation of security issues was discussed. In a circular of instructions to applicants for the committee's approval of contemplated issues, the committee and its advisory board, headed by Allen B. Forbes, explained that the pur-



poses and circumstances surrounding each issue must be described in full in the application. This is particularly necessary if funds are needed for extension of improvements relating directly to war production or for fulfillment of any national, state or local governmental requirement. "In all cases," said the instructions, "full reasons should be given why the proposed issues cannot be postponed until after the war or why the necessity is greater than the paramount need of the National Government in conserving the financial resources, materials and labor of the country for the war." Details concerning capitalization and financial condition of a company are required in connection with applications for issuance of stock. For state, county or municipal issues, the committee requires a copy of the bill, resolution or ordinance under which they are authorized. The committee announced that it is working with the federal office of public roads in determining what contemplated road construction this year is necessary for urgent military or economic reasons. Most roads to which the bureau heretofore has planned to contribute will be built even under the capital issues restrictions, it is said, since they have been carefully selected on the basis of their economic importance. The support of state highway commissioners was enlisted at a recent conference with the capital issues committee and they will report soon to the public roads bureau an outline of their respective curtailed road-building program for the year.

#### Raise Pay of All Employees.

Dubuque, Ia.—Besides raising the pay of policemen and firemen, council has increased the wages of the city laborers, including the sewer gang, the sewer inspector and the ward foremen. The laborers now receive \$2.50 for a nine-hour day, or 28 cents an hour for less than a day; the sewer inspector will receive \$85.00 per month instead of \$75.00 and the ward foremen will receive \$75.00 per month instead of \$65.00. Council also decided to increase the salaries of the other city officials, except the mayor and aldermen, ten per cent. The city carpenter was raised from \$55.00 to \$65.00 and the janitor from \$55.00 to \$65.00. It was also voted to raise the price paid for macadam broken by hand labor from \$1.00 to \$1.25 per cubic yard when quarried and from 75 cents to \$1.00 per yard when broken in the open.

#### New City Manager.

Brownsville, Tex.—The board of city commissioners has announced the appointment of W. E. Anderson, an engineer at Dallas, Texas, to be city manager of Brownsville. He has assumed his duties. Anderson has been prominent in engineering circles in Texas during the last twenty years. He succeeds F. H. Williams, resigned.

#### City Wins in Bond Sale Suit.

Rome, Ga.—A decision handed down by the Georgia supreme court in the case of Breed, Elliott and Harrison, a Cincinnati bond-buying firm, against the city of Rome ends a suit started about two years ago. The Cincinnati firm wanted to buy the \$50,000 of bonds issued by the city shortly before April, 1914, to secure funds for building the auditorium, and the bid was accompanied, as required by the city, by a certified check for \$500. The firm secured the bonds, its bid having been the highest, but refused to accept them because they had been issued by the mayor and council that governed this city at the time and were signed by the mayor. The commission form of government assumed control of the city on April 1st of that year, and the Cincinnati firm wanted the bonds reissued and signed by the commission. This the city attorney held was unnecessary, and the refusal to accept the bonds sold to them, by the Cincinnati firm, was followed by the city taking their \$500 check to pay the expense of readvertising and reselling the bonds, as it was considered to have been put up as a forfeit. The firm then brought suit against the city for the recovery of this check, and also brought suit for \$1,300, which it claimed would have been their commission had it secured and sold the bonds. Judge Wright, at the hearing of the cases here, decided that the \$1,300 could not be recovered, and his decision was upheld

by the supreme court. He also decided that the bond buyers should have their \$500 check returned to them, and from this decision the city, through the city attorney, appealed to the supreme court, which has not yet decided this phase of the matter.

## TRAFFIC AND TRANSPORTATION

#### State Commissioner Must Approve Local Traffic Rules.

Trenton, N. J.—That approval of any local traffic ordinance by the state commissioner of motor vehicles is necessary before it becomes effective is the substance of an opinion handed down in the supreme court by justice Black setting aside the conviction of John A. Eveler under an ordinance of Atlantic City prohibiting the parking of cars within a certain distance of the boardwalk for longer periods than are required to load or unload them. Justice Black remarked that under the state traffic act of 1915 such ordinances are without effect unless approved by the commissioner of motor vehicles. He added: "The statute is clear. There is no room for construction. It is founded in a wise public policy, namely, to promote a uniformity of regulating traffic throughout the state. It should be observed and not evaded by the local authorities."

#### Proposes Street Viaduct to Relieve Traffic.

New York, N. Y.—Dr. John A. Harriss, deputy police commissioner in charge of the traffic, announced that he is working on a plan to relieve traffic conditions by having constructed an elevated roadway for automobiles and persons on foot along Sixth avenue paralleling the present elevated structure between Bryant Park at Forty-second street and Fifty-ninth street in Central Park. "A roadway would be built on either side of the elevated tracks," said commissioner Harriss, "on the same level with the elevated structure now in operation and between the tracks and the buildings. The roadway east of the tracks would be used for northbound traffic and the west roadway for southbound vehicles. The roadways would be used for through traffic only, the entrances and exits being at Fortieth street and at Central Park. The object of this roadway would be to relieve Fifth avenue, Broadway, and other streets by providing a much quicker way north and south and particularly to relieve the very serious congestion at Forty-second street."

#### "Movies" to Teach Highway Safety.

New York, N. Y.—Automobile and moving picture men have combined to support a vigorous safety-first campaign designed to reach not only the pedestrians and motorists of New York but of the entire nation. Francis M. Hugo, secretary of state of New York, recently described the plans of the whole campaign for safety. He said that with 1,200 deaths due to automobiles last year there was going to be drastic action taken by state legislatures if the educational propaganda failed. The plans, as Mr. Hugo announced them, are for a safety-first motion picture to be shown from one end of the United States to the other. Such a picture already has been made by a leading film company. "In 1901," said Secretary Hugo, "the first license was issued in New York for motor vehicle operation. Last year we licensed 138,000 chauffeurs and we expect to pass the 150,000 mark. To supervise this number I have six inspectors. I am able to announce for the first time, however, that an arrangement has been made with the state department of education and the state constabulary whereby every child in the state will be taught the rules of the road. It is as important for him to know how to cross the street nowadays as it is for him to know his a-b-c's." Mr. Hugo said that he was determined to drive the intoxicated chauffeur and the unlicensed driver from the highways of the state. He urged the passage of two bills now pending in the legislature, one providing that operators of motor vehicles be required to obtain a license to drive anywhere in the state (there is such a law now applicable only to New York city), and the other creating an authority in the secretary of state to supervise and pass upon headlight dimmers.

## THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

### ROADS AND PAVEMENTS.

#### Bituminous.

Worcester Asphalt Mixing Plant. Data on operation of municipal plant. By Albert T. Rhodes, Commr. of Street Work. 1 ill., 1,400 words. Municipal Engineering. February. 30 cts.

Rhode Island Practice in Construction of Bituminous Macadam. Paper before Providence Engineering Society. By I. W. Patterson, chief engineer, State Board of Public Roads. 3,600 words. Engineering & Contracting. Feb. 6. 15 cts.

New Features in the Design and Construction of Bituminous Roads and Treatments and Cement Concrete Roads and Pavements. Paper before American Road Builders' Assn. By Chas. N. Upham, chief engineer, Delaware Hwy. Comm. 4 ills., 4,300 words. Good Roads. Feb. 16. 15 cts.

Repairing Bituminous Pavements. Causes of defects and methods of treating each. 2,200 words. Municipal Journal. Feb. 2. 10 cts.

Bituminous Roads, Mixed and Penetration Methods. General discussion of advantages and methods. 3 ills., 2,000 words. Better Roads & Streets. February. 20 cts.

Relative Efficiency of Methods of Repairing Bituminous Macadam and Bituminous Concrete Pavements. Paper before American Assn. for Advancement of Science. By Geo. H. Biles. 3,800 words. Engineering & Contracting. Feb. 6. 15 cts.

#### Brick.

Failure of Brick Pavement. Caused by careless construction. By Harlin H. Edwards. 2 ills., 1,500 words. Municipal Engineering. February. 30 cts.

Rattler Tests for 3-in. Paving Brick. Allowing for small size in rattler loss. Paper by Wm. C. Perkins. 1,800 words. Engineering & Contracting. Feb. 6. 15 cts.

Brick Pavements Being Adapted to Country Roads. Abstract of paper by Clifford Older before American Road Builders' Assn. 800 words. Engineering News-Record. Feb. 28. 20 cts.

Rattler Tests for Paving Brick of Various Depths. Paper before American Assn. for the Advancement of Science. By Wm. C. Perkins. 3,000 words. Better Roads & Streets. February. 20 cts.

#### Concrete.

Methods of Repairing Concrete Roads. Experiences in Michigan. By Frank F. Rogers, State Hwy. Commr. 600 words. Engineering & Contracting. Feb. 6. 15 cts.

Cold-Weather Construction of Concrete Roads. Suggestions made by Prof. Duff A. Abrams. 700 words. Municipal Journal. Feb. 2. 10 cts.

First Frost is Never Responsible for Cracked Concrete Roadways. Damage can be traced to the freezing which follows a thaw. Water-logged soil confined between solidly frozen earth and new layer of ice expands and cracks slabs. By J. L. Harrison. 2 ills., 2,200 words. Engineering News-Record. Feb. 28. 20 cts.

#### Granite Blocks.

Approved Practice in Construction of Granite Block Pavements. Paper before American Assn. for the Advancement of Science. By Clarence D. Pollock. 4 ills., 2,000 words. Municipal Engineering. February. 30 cts.

#### Wood Block.

Wood-Block Pavement Failures of Southern Cities Analyzed. Abstract of paper by C. H. Teesdale before American Wood Preservers' Assn. Complete data from 62 pavements in 13 Southern cities. 2 ills., 3½ pages. Engineering News-Record. Feb. 14. 20 cts.

#### Construction.

State Highway Construction in California Under Commission Supervision. Discussion before League of California Municipalities. 1,000 words. Pacific Municipalities. February. 30 cts.

Road Construction in Oklahoma. Re-

view of work done during 1917, and funds provided for 1918. By T. F. Hensley, publicity mgr., Dept. of Hwys. 2,500 words. Better Roads & Streets. February. 20 cts.

Construction and Maintenance of Highways Under War Conditions. Paper before American Assn. for the Advancement of Science. By Arthur H. Blanchard. 2,200 words. Better Roads & Streets. February. 20 cts.

#### Maintenance.

State Maintenance System for North Carolina. Brief discussion of system employed. By E. H. Winslow, state maintenance engineer. 1 ill., 800 words. Better Roads & Streets. February. 20 cts.

Street Repairs in Columbus, O. Study of experience in maintaining various classes of pavements during several years past. By Chas. C. Brown. 2,400 words. Municipal Journal. Feb. 2. 10 cts.

New Features in the Maintenance, Reconstruction and Repair of Earth, Sand-Clay, Gravel, Water-Bound Macadam and Bituminous Roads. Penetration Method. Paper before the American Road Builders' Assn., by Alexander W. Graham, Chf. Hwy. Engr. of Missouri. 2,700 words. Good Roads. Feb. 23. 15 cts.

The North Carolina State System of Road Maintenance. Forms used by supervisors and others in reporting and recording information. 1 ill., 2 pages. Engineering & Contracting. Feb. 6. 15 cts.

#### Grades.

Establishment of Grades. From the legal point of view. By D. J. Hall, city attorney of Richmond. 1,000 words. Pacific Municipalities. February. 30 cts.

Road Grades, Widths and Thickness and Crown of Surfacing. General conclusions of Am. Soc. C. E. Committee on Road and Materials. 2,400 words. Engineering & Contracting. Feb. 6. 15 cts.

#### Drainage.

Road Drainage. Paper before Indiana Road School by J. L. Harrison. 3,200 words. The Canadian Engineer. Feb. 21. 15 cts.

#### Traffic.

Makes \$35,000 Traffic Census in Chicago Loop. Maximum hourly record 1,142 vehicles. Double-deck street will separate fast and slow traffic. Automobiles are used mainly for business. 1 ill., 3,300 words. Engineering News-Record. Feb. 7. 20 cts.

The Highway: Its Relation to Transportation. Paper before the American Road Builders' Assn. by S. M. Williams. 3,500 words. Good Roads. Feb. 16. 15 cts.

#### Laws.

Highway Legislation in Virginia. Changes suggested to provide more efficient road transportation. By Geo. P. Coleman, State Hwy. Commr. 2,100 words. Good Roads. Feb. 9. 15 cts.

Traffic Laws in Relation to Highway Construction and Maintenance. Paper before American Road Builders' Assn. By W. A. McLean, Deputy Minister of Highways, Ontario. 3,000 words. Good Roads. Feb. 16. 15 cts.

#### Financial.

Cost-Keeping and Construction Accounting. Address before Northwestern Society of Highway Engineers. By G. Ed. Ross, Auditor, Oregon State Hwy. Dept. 3,800 words. The Canadian Engineer. Feb. 21. 15 cts.

Financial Burden of the State Highways. Discussion of how costs should be divided. By Chas. F. Stern. 3,000 words. Pacific Municipalities. February. 30 cts.

Financing Pavement Construction and Renewals. Based on practices at Utica, N. Y., and other cities. 3,800 words. Engineering & Contracting. Feb. 6. 15 cts.

Keeping Records for Street Work Proceedings. Description of plan used in

Daly City, Cal. By Chas. L. Biebel, city clerk. 1 ill., 1,500 words. Pacific Municipalities. February. 30 cts.

#### Societies.

Convention of American Road Builders' Association. Narrative of the St. Louis Convention. 2,500 words. Municipal Journal. Feb. 16. 10 cts.

Convention of American Road Builders' Association. Description of Fifteenth Annual Convention. 1 ill., 5,500 words. Good Roads. Feb. 9. 15 cts.

#### Miscellaneous.

Paving Work for 1918. Discussion of present outlook. 700 words. Municipal Journal. Feb. 15. 10 cts.

Paving Work in St. Louis. Review of work done during 1917. Organization of force, itemized costs, and operation of municipal asphalt plant. 4 ills., 3½ pages. Municipal Journal. Feb. 2. 10 cts.

Creation of More Equitable Contract Between Highway Commissions and Contractors. Paper before American Road Builders' Assn. By James C. Travilla. 3,000 words. Good Roads. Feb. 16. 15 cts.

Making Street Openings. Use of compressed air for this purpose in San Francisco. By P. E. Chapman. 1 ill., 800 words. American Gas Engineering Journal. Feb. 16. 15 cts.

St. Louis and Its Streets. General description of streets and kinds of pavement used. By Wm. Holden. 10 ills., 4,000 words. Good Roads. Feb. 2. 15 cts.

Effect of the War on Road Improvement. Contract prices for Federal aid work in Pennsylvania, Ohio, Maryland and Virginia. By H. A. Bishop, Office of Public Roads. 2,200 words. Good Roads. Feb. 2. 15 cts.

Street Paving During 1917. Tables giving summary of pavements laid by about 600 cities, with characters and costs of same; also road materials available in each locality. 16 pages. Municipal Journal. Feb. 16. 10 cts.

Programs for War Roads. Selecting essential roads and best types of pavement. Abstract of paper by Geo. C. Diehl. 2 ills., 2,000 words. Municipal Journal. Feb. 16. 10 cts.

Military Roads of Texas. Outline of what the State Hwy. Dept. would like to do. By Geo. A. Duren, State Hwy. Engr. 1 ill., 2,000 words. Better Roads & Streets. February. 20 cts.

Street Paving and Maintenance in Chicago. General discussion of practices and legal procedures. By Felix S. Mitchell, Supt., Bureau of Streets. 5 ills., 4,000 words. The American City. February. 40 cts.

### SEWERAGE AND SANITATION.

#### Designing.

Design and Construction of Vitrified Pipe Sewers. Some practical hints for young engineers. By Chas. E. Collins. 1 ill., 3,500 words. Municipal Engineering. February. 30 cts.

Effect of City Zoning on Sewerage System Design and Cost. Impervious area, volume of sewage, length, depth and cost of sewers, all more or less affected. 1,400 words. Engineering News-Record. Feb. 21. 20 cts.

#### Construction.

Laying Large Pipes in Tunnel. Contrivance used in Vancouver. B. C. 2 ills., 600 words. Municipal Journal. Feb. 2. 10 cts.

Reconstruction of Queen Street Sewer, Toronto. Wooden separating troughs used; details of diversion chambers. By W. S. Harvey and W. G. Cameron, Engrs. of the Dept. of Sewers. 9 ills., 5,000 words. The Canadian Engineer. Feb. 14. 15 cts.

#### Sewer Pipe.

Supporting Strength of Sewer Pipe in Trenches. Result of tests by Iowa Engineering Experiment Station. 2,400 words. Engineering & Contracting. Feb. 13. 15 cts.



**Service Strength of Sewer Pipe.** Theories and experiments by Iowa State College Experiment Station, relative to loads on sewer pipes in trenches. 1 ill., 2½ pages. Municipal Journal. Feb. 23. 10 cts.

**Sewer Pipe Joints.** Topical discussion before Boston Soc. of Civil Engrs. 2 ills., 8,000 words. Journal of Boston Soc. of Civil Engrs. February. 60 cts.

**Manufacture of Sewer Pipe.** Process of manufacturing vitrified clay pipe described. By Dr. Frank Coleman. 3,500 words. The Canadian Engineer. Feb. 21. 15 cts.

**Sewage Treatment.**  
Some Operating Results of Pennypack Creek Sewage Treatment Works of Philadelphia. Data from the 1916 report. 1,500 words. Engineering & Contracting. Feb. 13. 15 cts.

**Principles of Sewage Disposal.** Brief review of the entire subject by T. Aird Murray. 5,000 words. Western Municipal News. February. 15 cts.

**Septic Tank Litigation.** Plea to resist payment of royalties. 1,000 words. Pacific Municipalities. February. 30 cts.

**Operating Problems of Imhoff Tanks.** Normal sludge digestion depends on enzyme liquefaction overbalancing bacterial decomposition. Abstract from paper by Geo. W. Fuller before New Jersey Sewage Works Assn. 2,000 words. Engineering News-Record. Feb. 28. 20 cts.

**Electro-Chemical Sewage Treating Process.** Description of plant operated at Decatur, Ill. By W. S. Shields. 3 ills., 6,000 words. Municipal Engineering. February. 30 cts.

**Disposal of Sewage Sludge.** Discussion at Annual Meeting of Association of Managers of Sewage Disposal Works, England. 3,000 words. The Surveyor. Dec. 28. 20 cts.

**Methods and Costs of Pressing Sewage Sludge.** Paper before Am. Soc. of Municipal Improvements. By Kenneth Allen. 5,500 words. Engineering & Contracting. Feb. 13. 15 cts.

**Treatment of Sewage by the Activated Sludge Process.** Continued from previous issue. Data from the Milwaukee Experiment Plant. 3 ills., 4,500 words. The American City. February. 40 cts.

**Recovery of Grease and Fertilizers from Sewage.** Massachusetts Joint Investigating Board reports against applying Miles acid process. 4,500 words. Engineering News-Record. Feb. 14. 20 cts.

**Sanitation.**  
Sanitary Work in the Army. Describes methods and appliances used in the British army. By Major Arthur J. Martin. 1,500 words. The Surveyor. Dec. 28. 20 cts.

## WATER SUPPLY.

### Dams and Reservoirs.

**Earth Dam with Screened Gravel Core and Pipe Drains.** Pervious interior and drainage system prevent saturation. Dam has steel movable crest, concrete spillway and outlet culvert with gate tower. By L. B. Branch, Engr. U. S. Reclamation Service. 4 ills., 2,900 words. Engineering News-Record. Feb. 21. 20 cts.

**Will Cost Half Million to Make Austin Dam Usable.** D. W. Mead advises Austin, Tex., that partly rebuilt dam still is defective in foundation and superstructure. 1 ill., 1,300 words. Engineering News-Record. Feb. 21. 20 cts.

**Repairing Disintegrated Concrete on Dam with Cement Gun.** Dam at Jenkins, Ky., 40 ft. high and 600 ft. long. 2 ills., 700 words. Engineering & Contracting. Feb. 20. 15 cts.

**Effect of Covering a Service Reservoir.** Author believes every reservoir should be covered. By John Gaub, chemical engr. of Washington, D. C., filtration plant. 2,500 words. Fire & Water Engineering. Feb. 6. 15 cts.

**Pumping.**  
Cost of Operating Electric Pumping Plants in Iowa. Result of investigation by Iowa Engineering Experiment Station. 2,300 words. Engineering & Contracting. Feb. 13. 15 cts.

**Pumping Station Addition Built Under Difficulties.** Knoxville, Tenn., put temporary 15,000,000 gallon high duty pump on steep hillside between boiler house and tracks. By John W. Hill. 2 ills., 700 words. Engineering News-Record. Feb. 28. 20 cts.

**Purification.**  
Filters and Aeration Remove Oily Taste from Water. Abstract of report by Langdon Pearse and S. A. Greeley. 800 words. Fire & Water Engineering. Feb. 20. 15 cts.

Mixing Baffles Cut Down Chemicals.

Materially reduced alum required in mechanical water filtration plant at Jackson, Miss. By John R. Baylis, chemist, Baltimore water filtration plant. 1,300 words. Engineering News-Record. Feb. 21. 20 cts.

**Drinking Water Protection in Industrial Plants.** Description of sanitary fountain and cooler. 2 ills., 1,200 words. Safety Engineering. February. 30 cts.

**Water Waste.**  
100,000 Tons of Coal Wasted by Chicago. Abstract of report by Chicago Bureau of Public Efficiency, showing waste caused by waste of water by consumers. 5 ills., 4,000 words. Municipal Journal. Feb. 9. 10 cts.

**Water-Waste Report Written to Educate Lay Public.** Prepared by Chicago Bureau of Public Efficiency. 3 ills., 3,200 words. Engineering News-Record. Feb. 7. 20 cts.

**Why Chicago Should Meter Its Water.** Abstract of Report by Chicago Bureau of Public Efficiency. 4,200 words. Engineering & Contracting. Feb. 13. 15 cts.

**Construction.**  
Machine Trenches 220 Feet an Hour in Shale. Experience in digging water works trench in Erie, Pa. 1 ill., 1,300 words. Engineering News-Record. Feb. 14. 20 cts.

**Los Angeles Water Department Appliances.** Methods and appliances developed by department for cutting out pavements, backfilling trenches, making cement joints, etc. By C. W. Geiger. 6 ills., 2,000 words. Municipal Journal. Feb. 23. 10 cts.

**Miscellaneous.**  
Supervision of Public Water Supplies by Health Officer. Abstract of paper before school for health officers. By Jack J. Hinman, Jr. 2,000 words. Fire & Water Engineering. Feb. 20. 15 cts.

**Water Supply of Camp Meade, Md.** Details of design and construction. By Morris Knowles, supervising engineer. 1 ill., 2,000 words. Municipal Engineering. February. 30 cts.

**Water Supply and Sewer System Cap de la Madeline, Quebec.** Brief description of pumping plant, reservoir and pipe laying. By Romeo Morrisette. 2 ills., 1,000 words. The Canadian Engineer. Feb. 21. 15 cts.

**Rivers as Sources of Water Supply.** Considered safe if properly purified. By Robt. Spurr Weston. 2,500 words. Municipal Engineering. February. 30 cts.

## STREET LIGHTING AND POWER.

### Central Stations.

**Plans for Seattle's Proposed Hydro-electric Plant.** Brief synopsis of specifications. 400 words. Electrical Review. Feb. 16. 30 cts.

**Walnut Station of Columbus Railway, Power & Light Co.** Description of new steam-electric generating station. 9 ills., 5,500 words. Electrical Review. Feb. 23. 30 cts.

**Central Station at Calgary.** Description of municipal electric plant. Hydro-electric and steam generated power supplied to street railway and light and power customers. By James F. McCall, supt. and chief engineer. 5 ills., 2,500 words. Electrical Review. Feb. 9. 30 cts.

**Electrical Features of Joliet Station.** High-pressure steam station of Public Service Co. of Northern Illinois. 2 ills., 2,500 words. Electrical World. Feb. 2. 15 cts.

**Light Saving.**  
Curtailement of Lighting. Discussion before Illuminating Engineering Society on Feb. 14. 2,200 words. Electrical World. Feb. 23. 15 cts.

**Curtailement of Lighting Means Small Coal Saving.** Figures to show that less than 1% of coal output can be saved. 2 ills., 1,200 words. Electrical World. Feb. 16. 15 cts.

**Miscellaneous.**  
Historical Lighting of Independence Square, Philadelphia. Description of past and present lighting. By E. F. Kingsbury. 6 ills., 8,000 words. Journal of Engineers' Club of Philadelphia. February. 40 cts.

**Devices for Testing Series Street Lighting Circuits.** Home-made motor-driven magneto described. 400 words. Electrical World. Feb. 2. 15 cts.

**Location of Switches on Distribution Lines.** Accessibility most important. 2 ills., 700 words. Electrical World. Feb. 9. 15 cts.

**Inexpensive Remote-Control Switch for Street Lighting.** Used on multiple electrolight lighting and signs. 1 ill., 500 words. Electrical World. Feb. 9. 15 cts.

## STREET CLEANING AND REFUSE DISPOSAL.

### Garbage to Hogs.

**Feeding Garbage to Hogs.** Abstract of discussion by a conference called by U. S. Food Administration. 1,500 words. Municipal Journal. Feb. 23. 10 cts.

**Hog Feeding in Worcester.** Description of municipal piggery, methods and results. 800 words. Municipal Journal. Feb. 23. 10 cts.

**War-Time Disposal of Garbage.** Comparison of reduction and of feeding to hogs, made by committee of Providence, R. I. 1,500 words. Municipal Journal. Feb. 9. Also 2,200 words in issue of Feb. 23. 10 cts. each.

**War-Time Disposal of Garbage.** Methods employed in eight of the largest cities briefly described. 2,200 words. Municipal Journal. Feb. 23. 10 cts.

**An Efficient System of Garbage Collection and Disposal.** Collecting garbage of Wilkes-Barre and feeding to pigs. By Fred. Goeringer, Commr. of Public Safety. 3 ills., 1,300 words. The American City. February. 40 cts.

**Incineration.**  
Operation of High-Temperature Incinerator Plant at Savannah. Summary of operation for 3 years and 9 months. By E. R. Conant, city engineer. 6 ills., 2,000 words. Municipal Engineering. February. 30 cts.

**Capacity of Toronto Refuse Destructor Exceeds Contract Provision.** Top-fed 180-ton plant burns 400 tons a day. By I. S. Osborn. 3 ills., 4,000 words. Engineering News-Record. Feb. 7. 20 cts.

**Reduction.**  
Effect of War on Garbage Disposal. Abstract of paper by I. S. Osborn, discussing effect of decreasing strength of garbage and increasing price received for reduction products. 600 words. Municipal Journal. Feb. 9. 10 cts.

**Snow Removal.**  
Snow Cleaning and Removal in Ottawa. Organization and appliances used. By L. McLaren Hunter, City Engineers Dept. 4 ills., 1,000 words. The Canadian Engineer. Feb. 14. 15 cts.

**Snow Removal on Pennsylvania Highways.** Methods and appliances used by State Highway Dept. By Geo. H. Biles, Second Deputy State Hwy. Commr. 6 ills., 1,200 words. Municipal Journal. Feb. 16. 10 cts.

**Sprinklers and Work Cars Make Good Snow-Plows at Chicago.** Wings hinged to sills; used on Chicago surface lines. 3 ills., 700 words. Electric Railway Journal. Feb. 9. 15 cts.

## STRUCTURES AND MATERIALS.

### Concrete.

**Some New Ideas in Concrete.** Theories advanced by Prof. Duff A. Abrams, recommending use of "fineness modulus," in proportioning aggregates. 600 words. Municipal Journal. Feb. 16. 10 cts.

**Porous Rock Makes Good Concrete of Light Weight.** Lava rock proved acceptable and may be used for concrete ships. 700 words. Engineering News-Record. Feb. 28. 20 cts.

**Pipe.**  
Bonus System Applied to Making Concrete Pipe. Description of plan adopted at Armstrong Cement Works. By F. H. Atwood, manager. 1,400 words. Engineering and Cement World. Feb. 15. 15 cts.

**Cast Half a Mile of Concrete Pipe per Day.** Materials handled in central plant and concrete delivered by motor truck on rails in largest pipe job on record. 4 ills., 1,500 words. Engineering News-Record. Feb. 28. 20 cts.

**Subway.**  
Most Notable Subway in the World. General description of New York's newest subway. 14 ills., 7,000 words. Engineering and Cement World. Feb. 15. 15 cts.

**Bridges.**  
Methods of Maintaining Old Highway Bridges. Repairing old abutments and piers and replacing inadequate foundations; bituminous wearing surface for floors; and painting steel bridges. Paper by G. F. Burch, acting bridge engineer, Illinois Division of Highways. 8 ills., 2,500 words. Engineering & Contracting. Feb. 27. 15 cts.

## MISCELLANEOUS.

**Motor Truck and Highway Transportation.** Paper before American Assn. for the Advancement of Science. By Maurice B. Greenough. 2,500 words. Better Roads & Streets. February. 20 cts.

(Continued on page 216.)

## NEWS OF THE SOCIETIES

### CALENDAR OF MEETINGS.

**March 11-13.**—MINNESOTA ELECTRICAL ASSOCIATION. Annual convention, Hotel Radisson, Minneapolis, Minn. Secretary-treasurer, H. E. Young, Minneapolis General Electric Company.

**March 13.**—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington. Secretary-treasurer, Geo. A. Reed, Montpelier, Vt.

**May 13-17.**—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

**March 17-24.**—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

**April 15, 16.**—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

**April 15-17.**—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

**April 18-19.**—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

**April 18-20.**—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Banglebaugh, El Paso, Tex.

**April 23-26.**—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

### The Engineering Council.

The Engineering Council, at its recent first annual meeting, elected J. Parke Channing, vice-president of the Miami Copper Company and the General Development Company, chairman; Harold W. Buck, first vice-chairman; George F. Swain, second vice-chairman, and Alfred D. Flinn, secretary. The following committees were appointed:

Executive committee: The chairman, the two vice-chairmen, and David S. Jacobus, Calvert Townley, George J. Foran.

Finance committee: E. Wilbur Rice, Jr., chairman; Charles F. Loweth, Sidney J. Jennings, David S. Jacobus.

Rules committee: J. Parke Channing, chairman; Clemens Herschel, Nathaniel A. Carle, Irving E. Moulthrop.

Public Affairs committee: Charles Whiting Baker, chairman; George F. Swain, Benjamin B. Thayer, E. W. Rice, Jr., Charles E. Skinner.

American Engineering Service: George J. Foran, chairman; George C. Stone, Alfred D. Flinn, Dr. Addams S. McAllister, Edward B. Sturgis, secretary.

War committee of technical societies: D. W. Bruntno, chairman; Arthur H. Storrs, secretary; James M. Boyle, Nelson P. Lewis (American Society of Civil Engineers), Edmund B. Kirby (American Institute of Mining Engineers), A. A. Greene, Jr., R. N. Inglis (American Society of Mechanical Engineers), Harold W. Buck, Dr. Addams S. McAllister (American Institute of Electrical Engineers), Dana D. Barnum, E. C. Uhlig (American Gas

Institute), Joseph Bijur, Dr. Charles A. Doremus (American Electro-chemical Society), Louis B. Marks, Preston S. Millar (Illuminating Engineering Society), Christopher R. Corning, George C. Stone (Mining and Metallurgical Society of America), Henry Torrance, F. E. Matthews (American Society of Refrigerating Engineers).

Fuel Conservation committee: L. P. Breckenridge, chairman; Ozni P. Hood, secretary; Robert H. Fernald, Charles R. Richards, Charles L. Edgar, Carl Scholz, David Moffat Myers, Edwin Ludlow, Harold W. Buck.

The definition of the Engineering Council that was adopted declared that "The Engineering Council is an organization of national technical societies of America created to provide for consideration of matters of common concern to engineers, as well as those of public welfare in which the profession is interested, in order that united action may be made possible."

The "Founder Societies" have 33,000 members.

### New England Water Works Association.

The March meeting of the New England Water Works Association is to be held at the Hotel Brunswick, Copley Square, Boston, Mass., March 13. After an executive committee meeting and a lunch, the following papers will be presented:

"The Past and Present Pumping Equipment of the Manchester Pumping Stations," by James H. Mendell, superintendent of water works, Manchester, N. H.

"Recent Legislation and Decisions of the Courts with Reference to the Sanitary Protection of Water Supplies," by Albert L. Sawyer, water registrar, Haverhill, Mass.

"Mountain Scenery," illustrated with colored slides, by Desmond Fitzgerald, consulting engineer, Brookline, Mass.

### Oregon Society of Engineers.

The following officers were elected for the coming year at the recent annual meeting of the Oregon Society of Engineers held in Portland: President, Orrin E. Stanley, who was formerly secretary of the society; secretary, C. J. Hogue.

### Engineers' and Architects' Club of Louisville.

The regular monthly meeting of the Engineers' and Architects' Club of Louisville was held on February 19. A paper on "Concrete Ships" was read by J. E. Freeman.

The officers elected for the ensuing year are: President, Addison W. Lee, Jr.; vice-president, L. C. Baird; secretary, Hermann Wischmeyer; treasurer, National Bank of Commerce.

The board of directors consists of

F. H. Miller, J. J. Murphy, Chas. H. Blackman, D. R. Lyman, Warwick M. Anderson and W. H. McAlpine.

### Minnesota Electrical Association

The annual convention of the Minnesota Electrical Association is to be held at the Hotel Radisson, Minneapolis, March 11, 12 and 13. Among the more important papers to be presented are "Minnesota Water Powers," by R. J. Thomas, superintendent of the St. Anthony Falls Water Power company, and "Iron-Wire Transmission Lines," by Prof. W. T. Ryan of the University of Minnesota. H. E. Young of the Minneapolis General Electric company is secretary-treasurer of the organization.

### Rochester Engineering Society.

The engineering society of Rochester, N. Y., has held a number of interesting meetings during February. Dr. W. F. Stone delivered an address

(Continued on page 218.)

## MUNICIPAL INDEX

(Continued from page 215.)

The Efficiency of the Motor Truck in Terms of Cost per Ton-Mile. Paper before the American Road Builders' Assn. By R. E. Chamberlain. 2,200 words. Good Roads. Feb. 23. 15 cts.

Delivery of the Motor Truck from the Factory to the Seaboard Under Its Own Power. Paper before the American Road Builders' Assn. By Raymond Beck, of the Council of National Defense. 2,000 words. Good Roads. Feb. 16. 15 cts.

Crow's Nest Traffic Signal. Elevated tower for traffic police. 1 ill., 100 words. Safety Engineering. February. 30 cts.

Telegraphs and Telephones in the First Year of War. Effect of the war on operating conditions. By John V. L. Hogan, Vice-Pres. Institute of Radio Engrs. 2,000 words. Electrical World. Feb. 16. 15 cts.

War Time Housing. Suggestions for America taken from England's experiences. By Fred. L. Ackerman. 2 ills., 2,000 words. The American City. February. 40 cts.

Municipal Markets. Considered from the viewpoint of administration. By Judge Frank T. Wilson. 4,000 words. Minnesota Municipalities. February. 30 cts.

Survey Monuments. Iron, bronze and concrete forms in use. Paper before Association of Ontario Land Surveyors. By J. W. Pierce. 1 ill., 2,600 words. The Canadian Engineer. Feb. 21. 15 cts.

Cost Plus Contract for Municipal Work. Details of plan employed by Rosedale, Kans. 2,800 words. Engineering & Contracting. Feb. 13. 15 cts.

Rate Increases to Follow High Cost of Coal. Companies find that rates for electric current must be increased. 1 ill., 3,000 words. Electrical World. Feb. 2. 15 cts.

Plans for Controlling Flood Waters in Miami Valley, Ohio. General description of earth dams and concrete work of project estimated to cost nearly \$24,000,000. 4 ills., 5 pages. Engineering & Cement World. Feb. 15. 15 cts.

Commission-Manager Form of City Government Does not Eliminate Politics. Experience of engineer-manager of Cadillac, Mich., indicates that plan does not prevent petty political methods. By T. V. Stephens. 2,000 words. Engineering News-Record. Feb. 28. 20 cts.

113 Miles of Pipe Line Completed in Record Time. How 16-inch pipe was laid over rocky bluffs and across rivers at the rate of a mile a day. By R. E. Morrison. 2 ills., 1,300 words. American Gas Engineering Journal. Feb. 2. 15 cts.

Legal Responsibility for Fires. Advocates holding owners or tenants responsible. 2,300 words. Fire & Water Engineering. Feb. 6. 15 cts.



# INDUSTRIAL NEWS

**Cast Iron Pipe.**—Government prices remain constant, but there is a tendency to cut about \$2 a ton on 6-inch and \$1.50 on 4-inch where business is competitive. Quotations: Chicago, 4-inch, class B and heavier, \$57.30; 6-inch, \$54.30. New York, 4-inch, class B and heavier, \$58.35; 6-inch, \$55.35; 3-inch, \$65.35. Birmingham, 4-inch, class B and heavier, \$52; 6-inch, \$49; class A \$1 extra.

**The Rensselaer Valve Company,** Troy, N. Y., announces the appointment of M. H. Collins as sales manager of its new Louisville branch.

**The Permutit Company,** 30 East 42nd street, New York city, announces the appointment of Francis D. West as sales representative in the New York territory. Mr. West was since 1907 chemist in charge of the Torresdale laboratory of the Philadelphia Bureau of Water and is the author of a number of favorably-known articles on water purification, including contributions to Municipal Journal.

## Detroit-New York Truck Service.

In order to help relieve railroad congestion and at the same time insure prompt deliveries of tires to its dealers the **United States Tire Company** has established a system of motor truck transportation between Detroit and New York. The first truck, loaded with 4,300 pounds of tires for the metropolitan district, arrived from the big Detroit factory of the tire company after bucking difficult snowstorms on the way east. The big vehicle, a two-ton Pierce-Arrow, was equipped with "Nobby Cord," pneumatic truck tires, and in spite of the strenuous work they were called upon to perform, it was found that neither truck nor tires showed signs of wear. The run from Detroit to Buffalo was made in twenty-eight and one-half hours—excellent time when the conditions are taken into consideration. Between Buffalo and Albany the truck encountered the worst roads and heaviest snows of the trip. Snowdrifts completely obscured the roadbed. This not only slowed down the speed of the last half of the

journey, but added materially to the wear and strain on the truck and tires. The United States Tire truck followed an army convoy of sixty trucks out of Buffalo, leaving them at Amsterdam a few hours, before arrival in New York City. Throughout the winter the United States Tire company has been a leader in urging the use of motor cars and trucks to alleviate traffic congestion on the railroads. In and around Detroit where the congestion in the railroad yards blocked traffic for weeks at a time, the Detroit factory of the United States Tire Company supplied the automobile plants in the city and suburbs by car and truck. The company's enormous fleet of cars and trucks has helped greatly in the delivery work during the past few months.

## Waterworks Manufacturers' Association.

At a meeting of the executive committee of the Waterworks Manufacturers' Association held Feb. 20 arrangements were made for the annual convention of the American Waterworks Association which will be held May 13 to 18 at the Planters Hotel, St. Louis. The following committees were appointed: Executive: E. B. Hodgman, chairman; George R. Ellis, H. F. Brown; entertainment committee: D. O'Brien, chairman; F. B. Leopold; W. C. Sherwood, Fred. Mueller, I. S. Holbrook, W. Van Winkle, Jr.; printing committee: I. S. Holbrook, chairman; D. B. McCarthy; badge committee: J. A. Kienle, chairman; E. K. Sorenson; transportation committee: W. H. Van Winkle, chairman; Fred J. Bradley, T. C. Clifford, H. M. Lofton, L. S. Barnard.

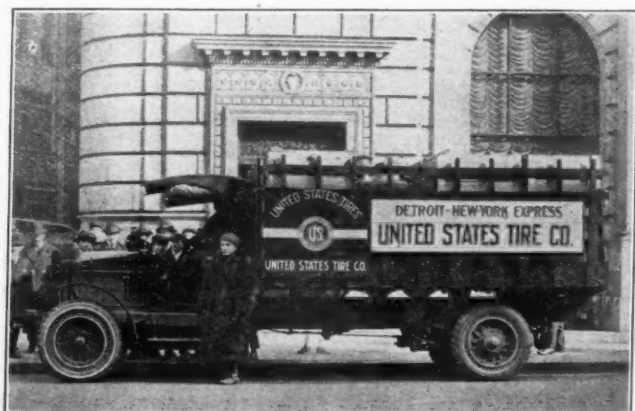
**Machinery Manufacturer Wins on Question of Branch Office.**—A New York court recently rendered a decision in favor of the Thew Automatic Shovel Co., Lorain, O., which is of decided interest to all construction equipment makers maintaining a branch office in New York state with home office in another state. The Thew Company was plaintiff against Christopher & Lockwood, contractors, for \$1,700 for payment due on a steam shovel. The contractors claimed that since the company was an Ohio cor-

poration, and was not registered in New York, it could not bring suit. Judge Morschauer decided that the company was simply represented in New York state by a salesman and that, although the contract was made in Ohio, the company could bring suit in New York. The Thew company was awarded \$1,793.06.

**The American-La France Fire Engine Co., Inc.,** Elmira, N. Y., has recently made the following shipments of fire apparatus: Phoenixville, Pa., Brockway type B combination; Duluth, Minn., type 12 pumping engine and hose car; Tyrone, Pa., type 14 combination service truck; Albion, Ia., type 40 combination with Junior pump; Port Huron, Mich., Brockway type B combination; Schenectady, N. Y., type 40 combination with Junior pump.

**Market for Pumps and Pumping Machinery in South Africa.**—According to consular reports, pumps and pumping machinery are used principally to supply water to municipalities, to meet agricultural and rural needs, and to satisfy the requirements of the mining industry. As mining is the principal industry of both the Transvaal and Southern Rhodesia, the principal demand is in connection with it, and the equipment already in use is valued at millions of dollars, and embraces the most modern and approved types.

Swiss, British and American pumps are used throughout this consular district. The most popular of the pumps manufactured in Switzerland is said to be the "Sulzer," while those imported from England are as follows: Climax, Tangye, Allen Pulsometer, Pearn, Robeson-Davidson, Rees-Roturbo, etc. German pumping machinery has never been extensively used, but the "Hoppe" pump had a fairly large sale previous to the outbreak of the war. However, it is said that the big pumping on the Rand is done chiefly with American machinery, working against heads of from 2,000 to 2,300 feet. Although the American plunger pump is stated to accomplish very good results, gradual inroads upon this system have been made by the high-lift centrifugal pump, which is manufactured both in the United States and on the continent. For municipal purposes water is obtained from underground sources, as the surface-water supply systems are comparatively rare, in view of the scarcity of lakes and rivers of importance near commercial or agricultural centers. In the case of the Witwatersrand, water is obtained partly from drilled wells and partly from shafts sunk in the dolomite formation. The Johannesburg municipality does not pump its own water, but obtains it from the Rand Water Board. The sale of water by this corporation amounted to 9,860,000 gallons a day for the period ended March 31, 1917. This is the largest quantity disposed of, the previous record being that of 9,637,000 gallons attained in 1913-14.



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Eliminating the mining industry, the demand for pumping machinery is somewhat restricted. Pumps are, however, used to some extent on farms and small tracts of land for irrigating purposes. The government has also assisted in this respect by employing a number of its drills to put down wells for farmers at practically the cost price of the work. Wells are usually six feet in diameter and 30 feet to the water level. In most cases the water is elevated 6 feet above the ground. Wells in this country are often fitted with windmill pumps, the use of which appears to be growing more popular.

The imports of pumps into the Union of South Africa amounted to \$432,134 and \$398,517 in 1915 and 1916, respectively, those from the United States totaling \$126,158 and \$136,242. In the case of southern Rhodesia, these figures were \$33,955, \$40,369, \$14,258 and \$14,361.

The imports of water-boring machinery into the Union of South Africa during 1916 were valued at \$991 compared with \$13,516 for 1915. These were principally American and British machines. The imports into southern Rhodesia amounted to \$33,582 during 1916, of which the United States furnished machinery valued at \$31,534. (A list of machinery merchants in the Johannesburg consular district can be obtained at the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its district or cooperative offices by referring to file No. 97005.)

## PERSONALS

McGilvray, Thomas F., formerly of the Duluth Engineering Co., and for a number of years city engineer of Duluth, Minn., is now in active training with the United States Engineers at Camp Lee, Petersburg, Va. He was commissioned a major of engineers last April.

Cenfield, F. H., was recently commissioned captain in the Quartermaster's Department. He has been acting head of the efficiency staff of the Chicago city council finance committee.

Hickok, C. E., city engineer of Alameda, Cal., has received a commission as a captain in the Engineer Reserve Corps.

Weirbach, Charles D., city engineer of Allentown, Pa., has resigned to become sanitary engineer for the United States Government under the director of health and sanitation, U. S. Shipping Board, Emergency Fleet Corporation. He will serve as sanitary engineer of the Hog Island shipyard, Philadelphia; the shipyard at Bristol, Pa., and the plant of the Submarine Boat Corporation at Newark, N. J., with headquarters in Philadelphia.

Mumm, Hans, Jr., city engineer of Everett, Wash., recently resigned to join the Portland Cement Association. He will work in eastern Washington and Idaho, with headquarters in Spokane. Mr. Mumm has lived in Ever-

ett since 1902. He has been assistant city engineer, county engineer and city engineer, and has also been connected with private concerns.

Aylesworth, M. H., has resigned as a member of the Colorado Public Utilities Commission, of which he was chairman. He is now assistant to the vice-president and general manager of the Utah Power & Light company.

Erb, George E., has been appointed a member of the Idaho Public Utilities Commission. He succeeds Axel P. Ramstet, former president of the commission, who resigned.

Lyman, D. H., for the past eight years chief engineer of the department of engineering, Louisville, Ky., has resigned, effective April 1.

Durham, H. W., major, Engineers' Reserve Corps, is now in command of the 41st Engineers, the first of the new road battalions to be organized for road construction and maintenance, in connection with the work of the expeditionary forces in France.

Cottrell, C. C., is now state highway engineer of Nevada, having succeeded R. K. West, who resigned. Mr. Cottrell has been assistant state highway engineer since the organization of the state department of highways. Previous to that he was connected with the California highway commission for four years.

Thompson, William G., has been appointed as state highway engineer for a term of five years by the New Jersey state highway commission. His salary will be \$7,000 per annum. He succeeds Robert A. Meeker, whose term expires on April 1. Mr. Thompson was formerly associated with Major-

General Goethals as engineer of construction on the Panama Canal. Edward E. Reed, of Trenton, was appointed assistant engineer for five years at a salary of \$5,000.

The following are new officials:

Portsmouth, O.—Mayor, H. H. Kaps; city engineer, Samuel G. Harper; director, public service, Ralph Calvert; director, public safety, Geo. W. Sheppard; police chief, Henry Clark; fire chief, George L. Koerner.

Johnstown, N. Y.—City engineer, Clarence Knowles; chief engineer, fire department, William Duesler; city clerk, Grover C. Yerdon.

## NEWS OF THE SOCIETIES

(Continued from page 216.)

On Feb. 5 on "Experiences at Our Army Cantonments." Francis W. Davies, assistant chief engineer of the truck dept., Pierce-Arrow Motor Car Co., spoke on Feb. 8 on "Increasing the Earning Power of Motor Trucks." William H. Landreth, deputy state engineer, discussed "Transportation Facilities of the Barge Canal" on Feb. 12. On Feb. 15, J. E. Freeman of the Portland Cement Association spoke on "Concrete Ships and Barges."

### Detroit Engineering Society.

On Feb. 15 the Detroit Engineering Society held a joint meeting with the Michigan Chapter of the American Society of Heating and Ventilating Engineers. Dr. E. Vernon Hill, sanitary engineer, board of health, Chicago, spoke on "Ventilation—The New Science vs. The Old Art."

## PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Niagara, Wis., is to construct SEWERAGE and WATER SYSTEMS. The engineer for the improvements is W. S. Shields.

Pender drainage district, Pender, Neb., is to build BRIDGES. Plans for the work were prepared by the Towle Engineering Co.

Extensive PAVING IMPROVEMENTS are to be made by Benscreek, Pa. Plans and specifications are to be prepared by L. R. Owen.

Redding, Cal., is to construct a wooden pipe WATER SYSTEM to cost over \$220,000. Plans for the work have been completed by the engineer, W. A. Cooper.

Liberty, S. C., is to build a WATER SYSTEM to cost about \$30,000. Plans and specifications for the improvement are to be prepared by the consulting engineering firm, J. B. McCrary Co.

Bonds for \$45,000 for a SEWERAGE SYSTEM were recently approved by Seal Beach, Cal. The consulting engineering firm of Olmsted & Gillelen was retained to prepare plans for the work.

Preliminary plans for a SEWERAGE SYSTEM for Grandview, Wash., are being prepared by the C. H. Greene Co.

SEWERS to be built by Union City, Ia., have been planned by the engineer, A. P. Purdy.

A WATER SUPPLY SYSTEM is proposed for Gaylord, Kans. The engineer for the improvement is G. P. Taylor.

Beresford, S. D., is to improve and extend its WATERWORKS. The engineer to plan the works is E. K. Mather.

A SEWERAGE SYSTEM to cost about \$230,000 is being planned for Fort Madison, Ia., by the consulting firm of Burns & McDonnell.

The Port of Portland (Ore.) Commission is preparing to extend the city's WATER TRANSPORTATION by starting a steamer line from the city to the Upper Columbia and Snake rivers. H. A. Rands has been retained as engineer to take charge of traffic surveys and make report on possibilities.